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SCHEME OF SOUND SYMBOLS

FOR THE PRONUNCIATION OF WORDS.

Note.—(-) is the mark dividing words respelt phonetically into syllables; (′), the accent indicating on which syllable or syllables the accent or stress of the voice is to be placed.

Sound-symbols employed in Respelling.	Representing the Sounds as exemplified in the Words.	Words respelt with Sound-symbols and Marks for Pronunciation.
ā	mate, fate, fail, aye	*māt, fāt, fāl, ā.*
ă	mat, fat	*măt, făt.*
â	far, calm, father	*fâr, kâm, fâ′thėr.*
ä	care, fair	*cär, fär.*
aw	fall, laud, law	*fawl, lawd, law.*
ē	mete, meat, feet, free	*mēt, mēt, fēt, frē.*
ĕ	met, bed	*mĕt, bĕd.*
ė	her, stir, heard, cur	*hėr. stėr, hėrd, kėr.*
ī	pine, ply, height	*pīn, plī, hīt.*
ĭ	pin, nymph, ability	*pĭn, nĭmf, ă-bĭl′ĭ-tĭ.*
ō	note, toll, soul	*nōt, tōl, sōl.*
ŏ	not, plot	*nŏt, plŏt.*
ô	move, smooth	*môv, smôth.*
ö	Goethe (similar to *e* in her)	*gö′tėh.*
ow	noun, bough, cow	*nown, bow, kow.*
oy	boy, boil	*boy, boyl.*
ū	pure, dew, few	*pūr, dū, fū.*
ŭ	bud, come, tough	*bŭd, kŭm, tŭf.*
ú	full, push, good	*fúl, púsh, gúd.*
ü	French plume, Scotch guid	*plüm, güd.*
ch	chair, match	*chär, măch.*
ċh	German buch, Heidelberg, Scotch loch (guttural)	*bôċh, hī′dėl-bĕrċh, lŏċh.*
g	game, go, gun	*gām, gō, gŭn.*
j	judge, gem, gin	*jŭj, jĕm, jĭn.*
k	king, cat, cot, cut	*kĭng, kăt, kŏt, kŭt.*
s	sit, scene, cell, city, cypress	*sĭt, sēn, sĕl, sĭt′ĭ, sī′prĕs.*
sh	shun, ambition	*shŭn, ăm-bĭsh′ŭn.*
th	thing, breath	*thĭng, brĕth.*
ṫh	though, breathe	*ṫhō, brēth.*
z	zeal, maze, muse	*zēl, māz, mūz.*
zh	azure, vision	*ăzh′ėr, vĭzh′ŭn.*

swim in vast numbers; to throng. SHOAL'ING, imp. SHOALED, pp. *shōld.*

SHOAL, n. *shōl* [Ger. *scheel, schel,* oblique: comp. OF. *escueil;* It. *scoglio;* Sp. *escollo,* a shelf on the sea, or rocks under shallow water (see also SHALLOW)]: a shallow place in the sea or a river; a sandbank: V. to grow more shallow, applied to depth of water: ADJ. shallow, as *shoal* water. SHOAL'ING, imp.: ADJ. filling up with shoals; becoming filled up with shoals. SHOALED, pp. *shōld.* SHOALY, a. *shōl'ĭ,* full of shallows. SHOAL'INESS, n. *-ĭ-nĕs,* the state of being shoaly; want of depth of water.

SHOAR. See SHORE 5.

SHOAT. See SHOTE.

SHOCK, n. *shŏk* [F. *choquer;* Sp. *chocar;* Dut. *schokken,* to jog, to knock against: Icel. *skykkr,* a jolt]: violent collision or onset; concussion occasioned by a collision; conflict of armed men; violence to the feelings; that which surprises or offends; impression of disgust; effect on the system produced by an accident, bad news, etc. (see SHOCK—COLLAPSE—REACTION): sudden effect produced by the passage of electricity through an animal body: V. to shake by violence; to meet with hostile violence; to cause surprise or offense; to strike with horror or disgust; to offend highly; to cause to recoil, as from something disgusting or horrible. SHOCK'ING, imp.: ADJ. causing surprise or offense; striking, as with horror; highly offensive; appalling; terrible. SHOCKED, pp. *shŏkt.* SHOCK'INGLY, ad. *-ĭng-lĭ.*

SHOCK, n. *shŏk* [a corruption of SHAG, which see]: a dog with long hair or shag, also called a *shock-dog;* a thick mass of short hair. SHOCK-HEADED, a. having thick and uncombed hair.

SHOCK, n. *shŏk* [O.Dut. *schocke,* a heap: Ger. *schock,* a quantity of sixty sheaves]: a pile of sheaves of wheat, oats, etc., set up on end in the harvest-field.

SHOCK—COLLAPSE'—REAC'TION: medical terms designating certain states of the bodily system which may result from sudden and violent injuries. It is well known that some forms of injury, e.g., a blow on the pit of the stomach, may occasion death without leaving any visible trace of their operation in the body; indeed, life may occasionally be destroyed by sudden and powerful mental emotions. In such cases as these, death is said to result from *shock,* the actual cause of death being sudden arrest of the heart's action, consequent on the violent disturbance of the nervous system. Instead of actual death, the condition known as *collapse* is more frequent, in which the patient lies in utter prostration, apparently on the verge of dissolution. The face, even the lips, are pale and bloodless; the skin is cold and clammy, and drops of sweat are often seen on the forehead. The features are

contracted, and there is great languor in the general expression. There is extreme muscular debility, and the sphincter muscles sometimes relax, so that there is involuntary discharge of the contents of the bowels and the bladder. The pulse is quick, and so feeble as often to be almost imperceptible; and the respiratory movements are short and weak, or panting and gasping. The patient is in some cases bewildered and incoherent; in others drowsy, sometimes almost insensible. Nausea and vomiting, with hiccup, are frequent symptoms; and in children, convulsions are often present.

When a person recovers from collapse, he passes into a condition termed *reaction,* which often lasts several hours. The first symptoms of this favorable change are improvements in the state of the pulse and the respiratory actions, recovery of the power of swallowing, increased temperature, and inclination to move from the supine position to one side. A slight feverishness then often ensues, after which the skin becomes moist, the patient falls asleep, and awakes convalescent. As a general rule, the longer the symptoms of reaction are delayed, the greater is the danger; and if several hours pass without any sign of reaction, there is little hope of recovery.

The principal causes of collapse are: Sudden and severe, or extensive injuries, as contused and lacerated wounds, involving a considerable amount of tissue—the crushing of a limb, for instance—burns, and severe surgical operations. Injuries of very important organs, or of the large joints, or other structures abundantly supplied with nerves. Pain alone, when intense and protracted, may cause profound shock. Certain poisons operate in this manner, depressing the system so suddenly and severely as to produce a state of collapse; tobacco, for example, in one unaccustomed to its use.

The effects of shock are aggravated by loss of blood; and hemorrhage alone, if sudden and profuse, will produce collapse. General debility and old age favor the production of shock, and much depends on the idiosyncrasy of the patient; an injury which will produce no apparent effect on one man often producing a serious condition in another.

The following are the most important points in treatment: The patient should be kept in a horizontal position, with the head on the same level as the body, and he should not be raised till decided symptoms of reaction appear. The best stimulus is brandy, in the form of hot brandy and water. But if no effects are apparent after an ounce or two has been swallowed, it is doubtful if any advantage will be gained from a larger quantity. At the same time, heat should be applied to the pit of the stomach and the extremities, by means of hot flannel, hot-water bags or bottles containing hot water, and other appliances. Hot beef-tea and hot coffee are also good stimulants in this condition. After reaction has set in

artificial stimulation should cease, for there is danger that the reaction may proceed too far and pass into inflammatory fever.

SHOD, v. *shŏd:* pt. pp. of SHOE, which see. SHOD'DY, a. of a trashy or inferior character; pretentious; not genuine; sham.

SHODDY, n. *shŏd'dĭ* [from SHED 3, which see]: formerly the flue or fluff *shed* or thrown off from cloth in the process of weaving; now, the wool of woven fabrics reduced to the state in which it was before being spun and woven, and thus rendered available for remanufacture: also, an inferior woolen cloth, made from a material consisting of old woolen goods torn to shreds, and new wool in varying proportions; in the United States, a textile fabric of any description of inferior or fraudulent character. Woolen rags, however old and worn, are now valuable to the manufacturer; they are sorted into two special kinds, rags of worsted goods and rags of woolen goods, the former being made of *combing* or long-staple wools, the latter of *carding* or short-staple wools. The worsted are those properly known as *shoddy* rags and the woolen are called *mungo.* Both are treated in the same way; they are put into a machine called a *willey,* in which a cylinder covered with sharp hooks is revolving, and the rags are so torn by the hooks that in a short time all traces of spinning and weaving are removed, and the material is again reduced to wool capable of being reworked. Shoddy was used formerly in adulteration and cheapening woolen cloths, but it is now found of greater advantage for making a class of light cloths adapted for mild climates, and other purposes. See WOOLEN MANUFACTURES.

SHOE, n. *shó,* plu. SHOES, *shôz* [AS. *sceo;* Goth. *skohs;* Dut. *schoen;* Icel. *skor;* Ger. *schuh,* a shoe: akin to Skr. *sku,* to cover]: a covering for the foot, usually of leather, and consisting of a sole and an upper (see SHOES; AND SHOE MANUFACTURE): rim or plate of iron fastened on the bottom of a horse's hoof for protection: bend or crook at the bottom of a water-pipe which discharges the water from a building: a sort of drag placed under the wheel of a loaded vehicle on going down a steep part of a road: in *mech.,* a notched piece on which something rests: a kind of trough: V. to fit the foot with a shoe; to furnish with shoes, to cover at the bottom. SHOE'ING, imp.: N. the act of one who shoes; the putting on of shoes. SHOD, pt. pp. *shŏd,* did shoe. SHOER, n. *shô'ĕr,* one who shoes horses. SHOE'LESS, a. *-lĕs,* without shoes. SHOE-BLACK, one who cleans shoes. SHOE-LEATHER, leather for shoes. SHOEMAKER, one who makes shoes. SHOE-TIE, or SHOE-LATCHET, that which fastens a shoe; shoe-string. SHOEING-HORN, a long concave piece of horn, ivory, metal, etc., which, by being placed between the heel of the foot and the back leather of the shoe, facili-

tates the insertion of the foot into the shoe. IN ANOTHER MAN'S SHOES, occupying the place or possessing the honors of another.

SHOE-BILLED STORK, or WHALE-HEAD: a large stork (*Balæniceps rex*) found on the White Nile. It is brownish-gray with black wings, tail and feet, the head is slightly crested, the bill short, broad and deep, with the tip hooked and mottled dusky and yellow. These birds, also known as 'boat-bills,' live in flocks in swampy woods and morasses, and feed upon all kinds of small reptiles, frogs, fish, mollusks and carrion. Although they perch upon trees, the nest is on the ground, a slight lining of grass, etc., in a slight hollow. The eggs are white and from 2 to 10 in number.

SHOEBURYNESS, *shô'bėr-ĭ-nĕs:* town in England, on the coast of Essex, at the mouth of the Thames, facing the Nore. A school of gunnery is here, with artillery barracks, batteries, targets, and other appliances for experimenting on cannon.

SHOE'ING OF HORSES. See HORSE-SHOEING.

SHOES; AND SHOE-MANUFACTURE: outside coverings for the feet; and the art of making them. Foot-covering, whether in the form of sandals or shoes, has been in use in every country aspiring to civilization in ancient and modern times. The rudimentary shoe is a sandal consisting of a sole, held to the foot by straps and thongs. Such were the common Egyptian and Greek shoes, to which the shoes of the peasantry of the Abruzzi, in s. Italy, bear close resemblance. In Egypt, however, the ordinary materials for shoes were strips of the papyrus interwoven like a mat. As is seen from paintings on the walls of Thebes, shoemaking formed a distinct trade in the reign of Thothmes III., B.C. 1495, or about the period of the flight of the Israelites. The streets of Rome were encumbered with the stalls of shoemakers in the reign of Domitian. The shoe of the ancient Hebrews was a species of sandal. For ladies, the sandal, translated 'shoe' in the Scriptures, was highly ornamental: 'How beautiful are thy feet with shoes, O prince's daughter' (Cant. vii. 1). Ornamented slippers are still a luxury in the East. The foot-coverings of the Romans were various in character, from the simple sandal and slipper to the boot, which extended up the leg. When the shoe covered the whole foot, it was termed *calceus;* the calceus of a particular form and of great strength worn by the Roman soldier was known as *caliga.*

Reference is made in Scripture to different symbolical usages in connection with sandals or shoes. The delivery of a shoe was used as a testimony in transferring a possession: 'A man plucked off his shoe, and gave it to his neighbor: and this was a testimony in Israel' (Ruth iv. 7). In cases of this kind, the throwing of a shoe on a property was a symbol of a new proprietorship or occu-

pancy: 'Over Edom will I cast my shoe' (Psalm lx. 8). From these ancient practices, in which the shoe was symbolical of contract, perhaps comes the curious old custom in England and Scotland of throwing old shoes for good luck after a bride and bridegroom on departing for their new home.

St. Crispin and his brother Crispinian have long been regarded as the patron saints of shoemakers. According to mediæval legend these personages were natives of Rome, and having become converts to Christianity, traveled into France and Britain to propogate the faith, everywhere supporting themselves by making shoes, which they sold to the poor at a very low price—one part of the legend being that an angel supplied them with leather. It is said that they suffered martyrdom in England toward the end of the 3d c. The memory of St. Crispin, of whom chiefly we hear, has from time immemorial been kept up by processions and other festivities in his honor on Oct. 25, 'St. Crispin's Day.' Under this saintly tutelage, shoemaking has attained the distinctive appellation of the 'gentle craft'; and is noted for the number of individuals who have risen from it to eminence. See an amusing but scarce work, *Crispin Anecdotes;* and a trade newspaper called *St. Crispin.* The sedentary and solitary nature of the craft, as formerly conducted, has possibly had some influence in producing a degree of thoughtfulness; while the act of hammering his leather is calculated, as some imagine, to stimulate the mental energy of the operative. If there be any real virtue in the sitting attitude of the shoemaker, a corresponding evil attends that method of carrying on his operations; for in every profession, sitting at work in a close atmosphere is injurious to health. Statistics assure us that out of 10,000 artisans who sit at their labor, 2,577 fall sick, and 95 die annually; while as regards an equal number of those who alternately sit and stand, only 1,713 sicken, and 61 die. As a remedy a simple and inexpensive work-bench has been invented at which shoes may be made standing: the only kinds of work in which sitting is more convenient are rounding the soles, lasting, and fitting.

The fashion of shoes, as of other articles of dress, has undergone innumerable changes. At one time, shoes were pointed to an extravagant degree; and in the 18th c., the high heels of ladies' shoes became a monstrosity. Shortly after the beginning of the 19th c., the most marked improvement was the making of shoes right and left; the substitution of latchets for buckles about the same period also was a step in advance. In our own day, a large disuse of the low shoe, and the introduction of high shoes, really short ankle-boots, are the chief changes of fashion. For a proposed nearer adaptation of shoes and boots to the shape of the foot, see FOOT. Till within recent years the usage has been for customers desiring good shoes to

order them and have them made to measure; but the buying of shoes ready-made has now become common. The cause of this is obvious: the process of measuring is usually very imperfect, owing, among other reasons, to lack of lasts to suit every variety of feet, as well as indifference or lack of skill to meet individual peculiarities. Accordingly, immense quantities of boots and shoes, in innumerable varieties and in all sizes and shapes, are now made and supplied wholesale by manufacturers for the retail dealers.

The system of making boots and shoes by isolated workmen at their own homes, has been found incompatible with the modern necessities of trade. As in the case of the handloom weaver, the shoemaker of the old school has had to succumb to machinery. After an unsuccessful struggle to oppose the introduction of sewing-machines in this manufacture these are now coming generally into use, and men and women are employed in large numbers together in shoe factories.

This manufacture has long been a staple trade in Mass., where boots and shoes are made by millions of pairs annually. A machine, invented in Salem, Mass., has been introduced for fixing the soles to the uppers by means of pegs: a pair of boots or shoes can be pegged in two minutes. These pegged goods are disposed of wholesale in boxes, and are found in retail stores all over the country. As evidence of the important character of the shoe-trade in Mass., it may be mentioned that a few years ago there were as many as 15 members of the 'gentle craft' in the legislature of that state. Ingenious machines have also been introduced for fastening the soles to the uppers by fine screws.

In 1900 there were reported 992 boot and shoe manufacturing establishments, employing $57,340,478 capital and 84,835 persons; paying $35,541,670 for wages, $95,-259,912 for materials used, and $6,799,439 for miscellaneous expenses; and yielding products valued at $151,-813,904.

SHOFAR: the ram's horn, blown in the synagogue on certain occasions, and dating from Bible times, frequent allusions to its use being given in the Old Testament, and throughout rabbinical literature. Signal-horn of war, as well as of the New Moon and solemn festivals, the year of jubilee; it has survived today in connection with the New Year ceremonial. Its shape, its appearance, its sounds, were made the subject of profound study and form an interesting chapter in the history of the Jewish ritual. The sages of the Cabala speculated on the significance of the shofar and its varied sounds. In the synagogue, its special use is to arouse the people to repentance, and the traditional call is almost universally maintained. In some of the American reform congregations, a cornet is used or the old-time call is sounded on the organ.

SHOG, v. *shŏg* [Swiss, *schaggen*, to jog: W. *ysgog*, a jolt; *ysgogi*, to wag (see SHOCK 1)]: in *OE.* and *Scot.*, to jog or joggle; to move off; to agitate by sudden interrupted impulses; to shake: N. a violent concussion. SHOG'GING, imp. SHOGGED, pp. *shŏgd*. SHOGGLE, v. *shŏg'gl*, to shake; to joggle. SHOG'GLING, imp. *-glĭng*. SHOG'GLED, pp. *-gld*.

SHO'GOON. See SHOGUN.

SHOGUN, n. *shō'gûn* [Japanese, generalissimo]: the so-called 'secular' emperor of Japan; in reality the governor and generalissimo of that country, or the military governor or commander-in-chief, the mikado being the real emperor or king.

SHOLA, *shō'lâ:* white pith of the leguminous plant *Æschynomene aspera*, native of the E. Indies. With this substance, which is exceedingly light, the natives of India make a great variety of useful articles, especially hats, which being very light and cool are in great request. Helmets of shola are much used by Brit. troops in India.

SHONE, v. *shōn* or *shŏn:* pt. pp. of SHINE, which see.

SHONTS, *shontz'*, THEODORE PERRY: railroad manager and Chairman of the Panama Canal Commission; 1856, May 5, b. in Crawford co., Pa., of French Huguenot and Dutch ancestry. His parents removed to Centerville, Iowa, and there he began his education in the public schools, subsequently completing a collegiate course at Monmouth College, Ill., in 1876. After graduation he returned to Centerville and became an accountant in a bank, where he invented a new system of accounting, and subsequently introduced it generally among the banks of Iowa. Having married a daughter of General Francis M. Drake, who was afterward elected governor of the state, he joined his father-in-law in building the Iowa Central railroad, and on its completion became one of its operating officers. In this position he gained an enviable reputation for excellent business methods and was promoted to general manager of the Iowa, Illinois and Indiana railroad, at Kankakee, and later became head of the Toledo, St. Louis & Western railroad, known as the Clover Leaf system. Subsequently, in partnership with Paul Morton, he engaged in several business ventures and speculations which added very materially to his wealth, and finally, when the President was seeking a chairman for the Canal Commission, Morton recommended his former partner, and on his consenting to assume the responsibilities of the position he was raised, in 1905, to the head of the world's greatest engineering enterprise. Resigning in 1907, he accepted the management of the New York City Transit System.

SHOO, or SHUE, v. *shô:* to scare off, as birds from corn. SHOO'ING, imp. SHOOED, pp. *shôd*.

SHOOK, v. *shûk:* pt. of SHAKE, which see.

SHOOK, n. *shûk* [from SHOCK 3, which see]: a set of staves sufficient to make one cask or hogshead, or a set of boards sufficient to make a sugar-box, prepared or fitted for putting together: whalers carry out the staves and headings for oil-casks ready prepared in shooks, and put them together on board as the catch of fish requires: furniture made in parts and not set up, but shipped in packs. SHOOK, v. to pack in shooks.

SHOON, *shûn:* in *OE.* and *Scot.*, plu. of SHOE.

SHOOT, v. *shôt* [Icel. *skjota;* Swed. *skjuta;* Dut. *schieten;* Dan. *skyde;* Ger. *schiessen;* AS. *sceotan,* to dart, to shoot]: to let fly or discharge anything with such force as to cause it to pass swiftly through the air; to send off with sudden force; to be emitted; to move swiftly along; to dart; to discharge, as from a gun; to maim or kill by letting off a gun; to penetrate, as words; to perform the act of shooting; to pass, as an arrow or a ball; to throw or send out, as a branch; to thrust forth, as the lips; to bud or sprout; to grow rapidly; to discharge, as earth or rubbish from a cart, etc.; to pass quickly over or under, as a rapid or a bridge: N. a young branch issuing from the main stock; an inclined plane down which timber, coal, etc., are caused to *shoot* or slide; a narrow passage in a river through which the water rushes rapidly; among *miners,* a vein running in the same direction as the strata in which it occurs. SHOOT'ING, imp.: N. act of using a gun or bow; the act or practice of killing game with firearms; sensation of a quick darting pain. ADJ. moving rapidly, as an arrow from a bow, or a ball from a gun; quick and darting. SHOT, pt. pp. *shŏt.* SHOOTER, n. *shôt'ėr,* one who shoots; an archer. To SHOOT AHEAD, to outstrip in running, flying, or sailing. SHOOTING-STAR, a meteor in a state of combustion, seen suddenly darting across some part of the sky. SHOOTING-BOX, a small house in the country for use in the shooting season. SHOOTING STICK, among *printers,* a tapering piece of wood or iron used in driving up the quoins in the chase. SHARP-SHOOTER, in *mil.,* a skirmisher sent out in front of a body of troops to annoy and pick off with his rifle individuals of the enemy's force. To SHOOT A BOLT, to make a bolt secure within its fastenings.

SHOOTING-STARS. See AEROLITE; METEOR.

SHOP, n. *shŏp* [OF. *eschope,* a stall or little shop: Ger. *schoppen,* a shed: AS. *sceoppa,* a stall: Icel. *skapr;* Dan. *skab,* a press or cupboard]: a place in which goods are sold by retail; a building in which mechanics work; a store; a warehouse: V. to visit shops for the purchase of goods. SHOP'PING, imp.: N. the act of visiting shops for the purchase of goods. SHOPPED, pp. *shŏpt.* SHOP-LIKE, a. vulgar; savoring of petty dealing. SHOP-BILL, a tradesman's business announcement. SHOP-BOARD, a bench on

which work is performed. SHOP-BOOK, a book in which a tradesman enters his sales on credit. SHOP-KEEPER, a trader who sells goods by retail in a shop. SHOP-LIFTER, one who, under a pretense of buying, steals from shops. SHOP-LIFTING, n. stealing from a shop. SHOP-MAN, one who serves in a shop. SHOP-WALKER, in a *large shop*, an attendant who directs customers to the proper department, and who sees that they are duly attended to. To TALK SHOP, to use phrases and manner of speech peculiar to one's employment or profession.

SHORE, n. *shōr* [Dut. *schore*, a tearing, a rent: Low Ger. *schoren*, to tear asunder: AS. *scceran*, to shear]: the land adjacent to a sea or ocean, or to a great lake or river (see SEASHORE). SHORED, a. *shōrd*, having a bank or shore. SHORE'LESS, a. *-lĕs*, of indefinite or unlimited extent. SHORE'WARD, ad. *-wėrd*, toward the shore. SEA-SHORE, the space between high and low water marks; the beach.

SHORE, n. *shōr* [Ger. *scharren*, to scrape: Swiss, *schoren*, to cleanse, to sweep out stables: Eng. *shoreditch*, being the ditch which receives the scrapings of the streets: erroneously supposed to be a corruption of *sewer*]: a public drain—see Wedgwood.

SHORE, v. *shōr:* pt. of SHEAR, which see.

SHORE, *shōr*, JANE: notorious woman of the 15th century. The chronicles are silent with regard to the time both of her birth and her death. She was the wife of one Shore, goldsmith, of London, but became one of the concubines of King Edward IV., whose favor, says Sir Thomas More, 'she never abused to any man's hurt, but to many a man's comfort and relief.' Her power of captivating lay no less in her wit and sprightliness than in her beauty of form or features. After Edward's death, Shore was mistress of Lord Hastings. Hastings having been beheaded for treason 1483, the protector of the kingdom, Duke of Gloster (afterward Richard III.), had Shore imprisoned as a sorceress, and confiscated all her belongings, which were valued at a considerable sum. By the judgment of the bp. of London, Shore was required to do public penance. She was afterward mistress of the Marquis of Dorset.

SHORE, n., or SHOAR, n. *shōr* [Norw. *skora;* Icel. *skorda*, a prop or shore: Dut. *schoor*, a prop]: a support: one of the stocks or strong props by which a ship is supported on dry land, or by which a wall or building is temporarily supported: V. to support with a prop or buttress temporarily. SHOR'ING, imp.: N. the act of supporting with props or shores; a number or system of props. SHORED, pp. *shōrd*.

SHORLING, n. *shŏr'ling* [from *shore*, pt. of *shear*]: in *Eng.*, the skin of a living sheep after shearing; *morling*, the skin taken from a dead sheep.

SHORN, v. *shŏrn:* pp. of SHEAR, which see.

SHORT, a. *shŏrt* [AS. *sceort;* OHG. *scurz;* Icel. *kortr,* Ger. *kurz;* L. *curtus,* short]: not long; not long either in space or time; inadequate; insufficient; imperfect; breaking or crumbling readily; crisp; brittle, as iron; not bending; brief; concise; quick; sudden; abrupt; angry; not going so far as intended: AD. not long; quickly; insufficiently: N. a summary or concise account, as in the phrase, 'the *short* and long of the matter is;' a word often given as a reply at the counter of a bank when the amount of a check is desired in a small compass. SHORTS, n. plu. the part of ground grain sifted out somewhat finer than bran. SHORT'LY, ad. *-lĭ,* soon; briefly. SHORT'NESS, n. *-nĕs,* the quality of being short; conciseness; deficiency. SHORT ALLOWANCE, less than the usual or regular quantity served out, as the allowance to sailors, soldiers, etc., during a protracted voyage, march, siege, or the like, when provisions are likely to be scarce. SHORT-BREATHED, *-brĕthĕt,* having a short quick respiration. SHORT CAKE or BREAD, bread baked of flour and butter that breaks easily and crisply. SHORTCOMING, a failing of the usual produce or quantity; a failure in duty. SHORT-COMMONS, n. a short or scanty allowance of food. SHORT-DATED, having little time to run, as a bill of exchange. SHORT-DRAWN, being of short breathing; imperfectly inspired. SHORT-EXCHANGE, n. in *com.,* the rate of exchange quoted in the market for bills payable 10, 20, 30, or more days after sight. SHORTHAND, a rapid system of writing by means of contractions and simple characters (see below). SHORTHAND-WRITER, one who professionally takes notes in shorthand; a reporter. SHORTHEAD, among *sailors,* a sucking whale less than a year old. SHORT-LIVED, not living or lasting long. SHORT RIB, one of the lower ribs; a false rib. SHORT-SIGHTED, a. not able to see distant objects; not able to see far intellectually; imprudent. SHORT-SIGHTEDNESS, n. a defect in vision (see SIGHT, DEFECTS OF): defective or limited intellectual sight. SHORT-SPOKEN, speaking in a quick short manner; gruff. SHORT-WAISTED, short from the armpits to the waist. SHORT-WINDED, affected with shortness of breath. SHORT-WITTED, having but little wit; of scanty intellect. AT SHORT NOTICE, in a brief time; promptly. IN SHORT, in a few words; briefly. THE LONG AND SHORT, the whole. THE SHORTS, on the *stock exchange,* the dealers who are deficient in those stocks at the time they have undertaken to deliver. TO CUT SHORT, to abridge; to stop suddenly. TO FALL or COME SHORT, to fail; not to do or accomplish. TO SELL SHORT, on the *stock exchange,* to sell for future delivery what the dealer has not in his possession at the time of contract, but which he hopes to purchase at a lower rate. TO STOP SHORT, to stop at once, or without reaching the point aimed at. TO TURN SHORT, to turn abruptly.—SYN. of 'short, a.': brief; laconic; concise; succinct; summary; limited; inadequate; insufficient; wanting; scanty; lacking; defective; imperfect; narrow; abrupt; contracted; pointed; petulant; severe; crisp; brittle; friable.

SHORT, CHARLES, LL.D.: educator: 1821, May 28—1886, Dec. 24; b. Haverhill, Mass. He graduated from Harvard Coll. 1846; taught in Andover, Mass., Roxbury, Mass., and Philadelphia 1847-63; pres. of Kenyon Coll. 1863-67; and prof. of Latin in Columbia Coll. 1868 till his death, succeeding Prof. Drisler. He edited Schmitz and Zumpt's *Advanced Latin Exercises*, revised Mitchell's *New Ancient Geography* and Andrews's Freund's *Latin Dictionary*, and wrote an essay *On the Order of Words in Attic Greek Prose*. He was sec. of the Amer. committee for revision of the New Test. and member of several learned societies. He was a painstaking and original writer, and contributed many critical and literary articles to the *Bibliotheca Sacra* and other reviews.

SHORT, WILLIAM; diplomatist: 1759, Sep. 30—1849, Dec. 5; b. Spring Garden, Va. He began his diplomatic career as sec. of legation when Thomas Jefferson was minister to France 1785, and was chargé d'affaires after Jefferson left Paris. Became minister-resident at the Hague 1792, but left the same year for Madrid as commissioner plenipotentiary to adjust the Fla. and Miss. boundaries, the navigation of the Mississippi, and commercial relations with Spain. He was commissioned minister-resident 1794, and concluded with Spain a treaty of commerce and boundaries.

SHORTEN, v. *shŏrt'n* [from SHORT, which see]: to make short; to lessen; to abridge; to contract; to become short. SHORT'ENING, imp. *-nĭng:* N. a making short or shorter; anything used, as butter or lard, to make pastry crisp. SHORT'ENED, pp. *-nd.* TO SHORTEN A ROPE, to take in the slack of it. TO SHORTEN SAIL, to reduce sail by taking the sails in.

SHORTHAND: a system of rapid writing, the process of which is so abbreviated as to keep pace with speech; also known according to the principle underlying the particular system as tachygraphy (quick writing), brachygraphy (short writing), stenography (compressed writing), and phonography (sound writing). It was practiced by the ancient Greeks and Romans, not only on account of its brevity, but for purposes of secrecy; but all knowledge of the art was lost from the tenth century until the end of the sixteenth, when modern shorthand had its birth in the publication by Dr. Timothy Bright of his *Characterie* (1588) and by Peter Bales of his *Arte of Brachygraphie* (1590). In these early systems arbitrary signs were used in most cases to denote each word. The earliest system of shorthand of any practical importance was that of John Willis, whose *Arte of Stenographie* (1602) became more or less popular. It was based on the common alphabet with the addition of arbitrary signs. This was the first real stenographic alphabet for shorthand, and a decided advance beyond Bright. The advance, indeed, was such,

that the author sincerely believed he had reached the goal, in spite of the many drawbacks in the cumbrous letters, and in the large omissions necessary to secure any degree of brevity, and the still larger number of indispensable arbitraries. His confidence shows itself in the description of his latest edition, where he says: "It is now twenty-one years since first was published this art of stenography, being the first book of spelling characterie that ever was set forth; since which time many others, taking their fundamental rules from this book, have sought to better the invention by changing the figure, power, or places of the literal characters, and by the various affixing of them one to another. Howbeit, I am confident in this persuasion, that as this art of stenography was the first that ever gave direction for any form of spelling characterie, so it shall continue the last, and wear out all the aberrations thereof published, or taught by any other." However thankful we may be for the one progressive step made by John Willis, we are still more thankful that his prediction was not fulfilled, and that the art did not stand still where he said it would. Even during his lifetime, a namesake of his, Edmond Willis, had announced a device which when fully developed later, came to be of great service and has continued to be to the present day; viz., that of separating the vowels from the consonants, and placing them around the strokes in different positions, so that they might be written or not according to need and opportunity. Among Willis's imitators were T. Shelton, whose system (1620) was used by Samuel Pepys, and that of Jeremiah Rich, whose system (1646) was commended by Locke. Rich's system was improved by William Mason (1672), the best shorthand writer of the seventeenth century, and Thomas Gurney published his *Brachygraphy*, founded on Macon's system in 1751 Mr. Gurney obtained an appointment from the government as its shorthand writer—an appointment that has descended with the Gurney family to the present day, though a large proportion of their staff (shorthand writers to the Houses of Parliament) now use the Isaac Pitman system. In 1767 appeared the *Universal English Shorthand* of John Byrom, an a, b, c, system characterized by "simple strokes and no arbitrary characters," and in 1780 was published an improvement of Byrom's system by William Mavor, Samuel Taylor published his *Stenography* in 1786. This, which is considered the best of all the a, b, c system, contributed largely to make stenography popular, and it was the system which was almost universally used until Isaac Pitman invented and gave his Phonography to the world in 1837, a system so practical and scientific that it has merited distinction above all others in public estimation. In comparison with Gurney's system, Taylor's system possessed more easy and natural outlines, and is therefore capable

of being written with a great degree of speed. Like Byrom, Taylor discarded arbitrary characters altogether; but Harding, who re-edited his system in 1823, introduced a few. It is instructive to compare the alphabets of these early inventors, and note the gradual improvement made in the one particular of alphabetic signs. If many modern inventors had carefully noted the attempts of these older times in the way of constructing alphabets, they would probably have been spared much hard labor and disappointment, and their deluded followers would have received like benefit.

The two qualities essential to good shorthand, whatever else may assist, are (1) Brevity, in order to secure rapidity in writing; and (2) fullness sufficient to make the writing legible. Should brevity be wanting, the purpose of shorthand is not met; and if the writing should prove illegible through too great brevity or any other cause, it is equally useless. By examining the above systems representative of this era of nearly three hundred years, a gain in the direction of brevity, so far as the alphabets are concerned, is evident; and at the same time the characters being as varied and significant as the Roman characters, the writing retains its legibility. When other gains are also taken into account, such as better joinings of letters, omitting silent letters, the gradual adoption of a phonetic principle, pairing of letters according to sound, using distinct signs for combinations of consonants and for syllables, substituting written words for arbitrary signs;—taking all theses into account the improvement, though slow, is very manifest.

As will be seen, Isaac Pitman had a number of predecessors, whose systems, like his own, were strictly phonetic. The best known modifications in the United States of the original Isaac Pitman phonography are, the Benn Pitman (1855), the Graham (1858), and the Munson (1868). Like all other phonetic systems, Pitman's rejects the ordinary orthography, and writes words according to their sounds; thus, though becomes *tho*; *plough* becomes *plow;* enough becomes *enuf*. Discarding the common alphabet, which formed the basis of the stenographic systems, it has adopted an alphabet of its own, consisting of straight lines, curves, dots, etc., each representing a distinct sound. This alphabet is the basis of a highly ingenious and perfect system, which aims at securing the greatest degree of brevity consistent with legibility, and this end it endeavors to obtain by a variety of devices, forming integral parts of the system. Isaac Pitman did not reach this point of perfection all at once, but it has been reached by test after test, not on his own part only, but on the part of the most expert and experienced reporters over the English-speaking world, whose aid the inventor had invited and thankfully accepted for more than half a century.

SHORTHAND.

Following is shown (by permission) the Isaac Pitman alphabet as presented in the Twentieth Century edition of the *Shorthand Instructor*, a recognized textbook in the leading schools and colleges:

THE PHONOGRAPHIC ALPHABET.

(BY ISAAC PITMAN.)

CONSONANTS.

EXPLODENTS.		CONTINUANTS.	
P	B	F	V
T	D	*TH*	TH
CH	J	S	Z
K	G	SH	ZH
NASALS. M		N	NG
LIQUIDS. L		R	
COALESCENTS. W	Y	ASPIRATE. H	

VOWELS.

LONG.			SHORT.		
1. AH		*as in* t*ah*	ă		*as in* p*a*t
2. EH		,, t*ay*	ĕ		,, p*e*t
3. EE		,, t*ea*	ĭ		,, p*i*t
1. AW		,, t*aw*	ŏ		,, n*o*t
2. OH		,, t*oe*	ŭ		,, n*u*t
3. OO		,, t*oo*	ŏŏ		,, f*oo*t

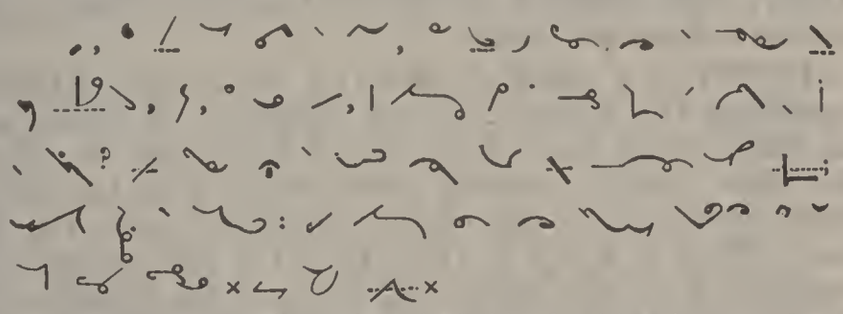
DIPHTHONGS. I OW OI U WI

Shorthand in Public Schools.—The great impetus towards practical education since 1890 has created new demands. This activity is manifesting itself in the establishment of business departments in normal and high schools. In this connection it is interesting to note that the new course of study inauguated September, 1903, by the New York Board of Education, includes the subject of phonography during the eighth year. In 1887, the Tercentenary of the origination of modern shorthand by Timothy Bright and the jubilee of Isaac Pitman's phonography were celebrated by the holding of the first International Shorthand Congress in London. In 1882-6 Thomas Allen Reed, A. J. Lawson, and J. R. Bruce, adapted Isaac Pitman's shorthand to the French language.

In rapid writing in Pitman's system the vowels are

generally omitted, as will be seen in the following examples, the first being in the easy reporting style, and the second in the condensed or brief style.

TRANSLATION OF ABOVE.—The general development of the country has necessitated a style of education not dreamed of fifty years ago. The commercial affairs of the country call for book-keepers, cashiers, stenographers, typewriters, entry clerks and bill clerks; the railroad business, the banking business, the importing business and the mercantile houses demand an army of well equipped, ready and proficient young men and women to transact their affairs intelligently.



Key.—Who, that is much in the habit of writing, has not often wished for some means of expressing by two or three dashes of the pen, that which, as things are, it requires such an expenditure of time and labor to commit to paper? Our present mode of communication must be felt to be cumbersome in the last degree; unworthy of these days of invention: we require some means of bringing the operations of the mind and of the hand into closer correspondence.—*English Review.*

Stenography in Germany.—From the middle of the seventeenth century until 1832, there was no system of stenography capable of taking a full reliable note of any public or private speech. Franz Iaver Gabelsberger (1789-1849) in 1817 commenced to construct his system, but it was fifteen years before he found a publisher. Like other inventions it was at first crude, but subse-

quent editions contained improvements which entitled it to first rank of all systems in Germany. The Prussian Chamber is the only exception to the official use of the Gabelsberger Shorthand in Germany. A statue of Gabelsberger was unveiled at a Shorthand Congress in Munich in 1890. The next in importance among the German shorthand authors is Henri Guillaume Stolze, 1798-1867. He has many followers, but wherever Governmental Committees have been appointed to look into the subject they have invariably reported in favor of Gabelsberger. The next place is given to Dr. Leopold Arends of Berlin (1860) and the fourth to Auguste Lehman (1875). In Italy, Signor Giuseppe Francini, of Rome, is devoting his life and means to the advancement of phonography, on the general Pitmanic basis as against the 'cursive' systems, so-called, of the customary continental stenographies. Consult: Isaac Pitman's *History of Shorthand;* John Westby-Gibson's *Bibliography of Shorthand;* Thomas Allen Reed's *Biography of Isaac Pitman;* the *Phonetic Journal,* 1842-1909; J. E. Rockwell's *Shorthand Instruction and Practice,* and the *Shorthand Instructor; Twentieth Century Instructor;* and the current periodicals devoted to the various systems.

SHORT'HOUSE, Joseph Henry: author; b. Birmingham, England, 1834; d. 1903, March 4. His most famous book is *John Inglesant,* historical romance (1881). Besides this he wrote *The Platonism of Wordsworth* (1881); *The Little Schoolmaster Mark* (1885); *Sir Percival* (1886); *A Teacher of the Violin, and Other Tales* (1888); and prefaces to George Herbert's *Temple* and Molinos's *Spiritual Guide.*

SHORTIA: a genus of plants of the *Diapensia* family, containing two species, one (*S. uniflora*), in Japan, and the other a very local plant, in the Alleghany Mountains. The latter species (*Shortia galacifolia*), is an interesting plant historically, being closely associated with Dr. Asa Gray. When in Paris in 1839, Dr. Gray saw an unnamed specimen, with only leaves and fruit, in the herbarium of the elder Michaux, who stated that he had collected it in 1788, in the high mountains of Carolina. In 1886, almost 100 years after it was first seen, and after much laborious searching, the *Shortia* was rediscovered by Dr. Sargent, in practically the identical region visited by Michaux. It has a creeping rootstock, a large tuft of long-petioled, evergreen leaves, with brownish stains, thin and serrate, and shaped very like the galax leaves used in floral decoration. There are several flower scapes, some six inches tall, bearing solitary nodding, fivemerous, bell-shaped flowers an inch long and wide, with white fringed petals.

SHORTT, Adam: Canadian political economist: b. near London, Ont., 1859, Nov. 24. He was educated at the universities of Queen's (Kingston, Ont.), Edinburgh,

and Glasgow, and on his return to Canada became an assistant in philosophy at Queen's University, and after the establishment of the Macdonald chair of political science at Queen's was appointed to fill it. He has made a close study of Canadian economic problems as well as of English and French colonial policies, and has published in the *Journal of the Canadian Bankers' Association* a series of papers on the *History of Canadian Currency* and *Banking and Exchange.*

SHOSHO'NE (or SNAKE) RIVER. See IDAHO.

SHOSHONES, *shō-shō'nēz,* or SNAKES: tribe of Indians found between the Sierra Nevada and Rocky Mountains from Ida. s. into Utah. They comprise the Shoshones proper, the Utes, and according to some authorities the Comanches, Moquis, and other tribes. The Shoshones proper have been separated into several bands, among which are the Koolsatikara or Buffalo Eaters, the Tookarika or Mountain Sheep Eaters, and the Shoshocos or White Knives. They were for many years engaged in defensive warfare with the neighboring Crows, Blackfeet, Cheyennes, and Arapahoes; but have lived in comparative peace with the whites, though there have been outbreaks, and a number of treaties have been made with them. The s. Shoshones subsist on roots and small animals, while the n. tribes hunt larger game and procure abundance of fish from the rivers. They dress in buffalo and deer skins, live in skin huts, and little has been done for their education or religious training. The Bannack are sometimes classed separately, but occupy the same reservations, and are closely allied.

The population of the Shoshonean tribes approximates 16,000, distributed as follows: *Bannock,* about 500 under Fort Hall agency and 100 under Lemhi agency, Idaho; total, 600. *Chemehuevi,* 250 under Colorado River agency, Arizona. *Comanche,* 1,409 under Kiowa, Comanche, and Wichita agency, Oklahoma. *Hopi,* or *Moki,* 1,841 (including Tewa), in seven pueblos in northeastern Arizona. *Paiute* (including many small bands), 200 near Fort Bidwell, Cal.; 656 on Pyramid Lake reservation; 413 on Walker Lake reservation, and 223 under Western Shoshoni agency, Nevada; 107 under Klamath agency and 78 under Warm Springs agency, Oregon; 100 at Saint George, Utah; to which should be added 128 Shivwits and 150 Kaibabs near Saint George, Utah, and between 3,500 and 4,000 (including Gosiute, Paviotso, etc.) in southeastern California and western Nevada; total about 5,800. *Shoshoni,* about 900 under Fort Hall agency and 300 under Lemhi agency, Idaho, 223 under Western Shoshoni agency, Nevada; 804 under Shoshoni agency, Wyoming; total about 1,327. *Tobikhar* (including Kawia), about 2,300 classed as 'Mission Indians' under the Mission Tule River agency, California. *Tukuarika,* or *Sheepeaters,* 98 under Lemhi agency, Idaho. *Ute,* 941 Capote, Moache, and Wiminuchi under Southern Ute

agency, Colorado; 457 Uinta, 820 Uncompahgre, and 371 White River Ute under Uinta and Ouray agency, Utah; total 2,589.

SHOSHONE FALLS: a waterfall in the Snake river (q.v.), in the southern part of Idaho, about 30 m. s. of Shoshone. Above the falls proper, the cañon is about 750 ft. wide and 1,200 ft. deep. The waters are deep and flow with scarcely a ripple until the rapids are reached, when the water spreads out fan-like and drops over numerous precipices, some 50 ft. in height, then, as it were, gathers its entire volume and plunges over a precipice 210 ft. in height. Below this fall the cañon is about 1,000 ft. in depth.

SHOT, n. *shŏt* [from SHOOT, which see]: act of shooting; balls or bullets for firearms (see below); globules of lead for killing birds or small animals: the flight of a missile, or the distance over which it passes: a shooter; a marksman, as a good or bad *shot:* in *Scot.*, among *fishermen,* the whole sweep of nets thrown out at one time; the draught of fishes made by a net; *familiarly,* the turn next in order; a stroke or move in play: V. to load with shot, as a gun. SHOT'TING, imp. SHOT'TED, pp.: ADJ. loaded or charged with shot. BAR-SHOT, a bar of metal with a round head at each end, formerly discharged as shot from guns. CASE-SHOT, or CANISTER, balls packed in tin canisters in the form of cylinders, having wooden bottoms, and fitted to the calibre of guns. CHAIN-SHOT, two half-balls united by a chain. GRAPE-SHOT, a number of shot so arranged as to resemble a bunch of grapes, formerly used to load guns. RED-HOT SHOT, shot heated to redness in a furnace, and in this state fired from a gun. ROUND-SHOT, a solid sphere of iron or other material as loading for a gun. SHOT-HOLE, the hole made by shot. SHOT-LOCKER, a piece of wood pierced with holes for holding shot, or for shot resting on. SHOT IN THE LOCKER, money in hand. SHOT OF A CABLE, the splicing of two cables; the whole length of cables thus united. SHOT-TOWER, a lofty tower erected for making small shot, from the summit of which melted lead is allowed to drop through perforated plates into water or other liquid at the bottom, the drops assuming a globular form, and cooling in their descent. TO SHOT GUNS, to load them. TO SHOOT GUNS, to discharge them.

SHOT, n. *shŏt* [AS. *scot,* a portion, money (see SCOT 1)]: reckoning; proportional share of expense incurred at a tavern. SHOT-FREE, but usually spelled SCOT-FREE, without payment; unpunished. TO PAY ONE'S SHOT, to pay one's share of a common expense.

SHOT: term applied to all solid balls fired from any sort of firearms, those for cannon and carronades being of different grades of steel, those for small arms, of lead: the latter are known as bullets and small-shot. The shot for guns vary from the 3-pounder, for boat and

mountain artillery, to the 13-inch shot, or larger—the 13-inch weighing about 300 lbs., as a shell, or 700 lbs. as an elongated bolt. Generally, shot are cast. There are simple practical rules for calculating the weight of *spherical* shot from the diameter, and *vice versâ*, which are often useful in reading of artillery actions. Given the diameter in inches, to find the weight in lbs.: Cube the diameter, and multiply the result by 14; reject the two right-hand figures; those remaining give the weight in lbs.—Given the weight in lbs., to find the diameter in inches: Multiply the cube-root of weight by 1·923, and the result is the diameter of the shot in inches.

The modern method of making shot was invented by Watts of Bristol, England, about 1782. Originally lead was rolled into a sheet which was cut into little cubes, which by 'tumbling' in a barrel were made approximately spherical. Watts's method involved the pouring of melted lead from a height into water. A perforated vessel like a colander, or a ladle with a wide serrated lip is employed. The lead is melted in furnaces at a sufficient height above the water tank destined to receive the shot. Special towers are used for the purpose. 180 ft. is an average height: at Villach in Corinthia there is a shot-tower 249 ft. high. New York has 25 towers. The melted lead, poured as described, falls down through the centre of the tower. By surface tension it breaks up into globules and solidifies in its descent. At the bottom of the tower is a tank of water into which it falls. The holes in the colander vary from $\frac{1}{50}$, $\frac{1}{58}$, $\frac{1}{66}$, $\frac{1}{72}$ inch, etc., down to $\frac{1}{360}$ inch in diameter, the latter for No. 9 shot. The colander is faulty, as it delivers the stream with varying rapidity according to the depth of lead. The ladle with serrated lip is now preferred; its serrations vary in size according to the size of shot desired. A little arsenic is alloyed with the lead. The wet shot are dried, being finally rolled between flannel rollers. They are then rolled down an inclined plane, or sloping table. The imperfect shot fall into a receptacle beneath the edge of the table, while the good ones, acquiring high momentum, shoot over this into a second receptacle beyond it. A series of such planes is sometimes employed, with openings between to receive the bad shot, while the good ones go over the openings as above described. By passing through graduated sieves the different sizes are separated, and finally the shot is polished by being placed in a revolving cylinder or other 'tumbling box,' with graphite.

Different methods have been proposed to avoid the use of towers, such as the employment of a strong upward blast of air (Smith 1849) to retard the fall of the shot.—See also CANISTER: CASE-SHOT: GRAPE-SHOT.

SHOTE, n., or SHOAT, n. *shōt* [from SHOOT, which see: AS. *sceota*, a shooting or darting thing, a trout]: a young swine half grown, or less. SHOTE, n. *shōt*, in *OE.*, a young pig; a young trout or salmon; in *Amer. slang*, an inferior or worthless character.

SHOTTEN, a. *shŏt'n* [from SHOOT, which see]: having thrown out the spawn, as herring; gutted or dried for keeping, as herrings; out of its socket; curdled by keeping too long. NOOK-SHOTTEN, in *OE.*, shooting or jutting out into nooks or angles. SHOULDER-SHOTTEN, in *OE.*, strained in the shoulder.

SHOTTS, *shŏts:* small and ancient village of Lanarkshire, Scotland, close to the Kirk of Shotts, about 16 m. e. of Glasgow. About 3 m. s.e. of the Kirk, modern S., or S. proper, began to rise at the close of the 18th c., when the Shotts Iron Company erected their extensive iron-works there. Valuable coal and ironstone, peculiarly suited for manufacture of iron, abound in the district. and a large number of workmen are employed in iron making and molding. S. forms the half-way station on the branch of the Caledonian railway between Edinburgh and Glasgow. S. may be said to consist of three villages —viz., Stane, Shotts Iron-works, and Dykehead; united pop. (1881) 2,985: pop. of the civil parish of Shotts, 11,214.

SHOUGH, n. *shŏk* [see SHAG]: OE. for SHOCK, a dog with long hair or shag; a shaggy dog.

SHOULD, v. *shŭd:* pt. of SHALL, which see.

SHOULDER, n. *shōl'dĕr* [Swed. *skuldra;* Dan. *skulder;* Dut. *schouder;* Ger. *schulter*, a shoulder]: part of the body at the top of each side of the chest and at the bottom and side of the neck; joint connecting the human arm to the body, or the foreleg to a quadruped (see SHOULDER-JOINT); anything resembling the shoulder; a prominence; sustaining power; support; strength: V. to push or thrust with

Boat with Shoulder-of-mutton Sail.

violence; to take upon the shoulder. SHOUL'DERING, imp. SHOUL'DERED, pp. *-dĕrd.* SHOULDER-BELT, a belt that passes across the shoulder. SHOULDER-BLADE, the flat bone of the shoulder; the scapula. SHOULDER-KNOT, an ornamental knot or ribbon, etc., worn on the shoulder. SHOULDER-STRAP, a strap worn on or over the shoulder. SHOULDER OF MUTTON, the foreleg of a sheep; the name given to a triangular sail for a boat. TO PUT ONE'S SHOUL-

DER TO THE WHEEL, to exert one's full strength to overcome a difficulty. TO GIVE THE COLD SHOULDER, to receive unkindly and indifferently, as a former intimate or friend.

SHOUL'DER-JOINT, THE: ball-and-socket joint uniting the arm to the body. The bones entering into its composition are the humerus or arm-bone, and the scapula or shoulder-blade, the large globular head of the former being received into the shallow glenoid cavity of the latter; an arrangement by which extreme freedom of motion is obtained, while the apparent insecurity of the joint is guarded against by the strong ligaments and tendons which surround it, and above by the arched vault formed by the under surface of the acromion and coracoid processes. See SCAPULA. As in movable joints generally, the articular surfaces are covered with cartilage, and there is a synovial membrane which lines the interior of the joint. The most important connecting medium between the two bones is the capsular ligament, a fibrinous

Fig. 1.—The left Shoulder-joint and its Connections.

1, the clavicle or collar bone; 2, the acromion process; 3, the coracoid process; 4, the capsular ligament; 5, the coraco-humeral ligament; 6, the tendons of the biceps muscle; 7, the shaft of the humerus or arm-bone; 8, the greater tuberosity of the humerus; 9, the lesser tuberosity; 10, the neck of the scapula; 11, anterior surface of the scapula.

expansion embracing the margin of the glenoid cavity above, while it is prolonged upon the tuberosities of the humerus below. From its relations with the surrounding muscles, the ligament derives much of its strength. Accordingly, in paralysis of the arm, one or two fingers can often be pressed into the joint toward the head of the glenoid cavity, from which the head of the humerus is now separated.

SHOULDER-JOINT.

The shoulder-joint exhibits the following varieties of motion: 1. Flexion, to a great extent; 2. Extension, in much more limited degree; 3. Adduction, in an oblique direction, forward and inward. 4. Abduction very freely; 5. Circumduction; 6. Rotation slightly.

The morbid affections of the shoulder-joint may be divided into (1) those arising from disease, (2) those resulting from accident. The most common diseases are acute and chronic inflammation of the joint, which often terminate in its ankylosis or immobility. The principal accidents are fractures and dislocations. There may be fracture (1) of the acromion process, or (2) of the coracoid process, or (3) of the neck of the scapula, or (4) of the superior extremity of the humerus; or two or more of these accidents may be associated. Again the head of the humerus may be dislocated from the glenoid cavity as the result of accident in three different directions—viz., (1) Downward and inward into the axilla, which is by far the most common form; (2) Forward and inward; and (3) Backward on the infra-spinous fossa, or the dorsum of the scapula. The first of these varieties is so frequent that persons of ordinary intelligence should know how to recognize, and even (in an emergency) to treat it. The bones are in the position shown in the figure; and the following are the most prominent symptoms: The arm is lengthened; a hollow may be felt under the acromion, where the head of the bone

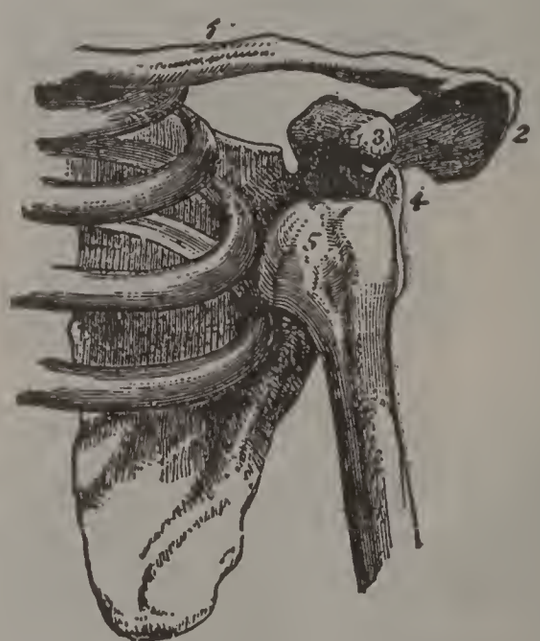


Fig. 2—Dislocation of the Shoulder-joint downward.
1, the clavicle; 2, the acromion process; 3, the coracoid process; 4, the glenoid cavity; 5, the head of the humerus lying in the axilla.

ought to be; the shoulder seems flattened; the elbow sticks out from the side, and cannot be made to touch the ribs; and the head of the bone can be felt if the limb is raised, although such an attempt causes great pain, from the pressure exerted on the nerves.

There are at least five methods of treating this form of dislocation: it is sufficient to notice two of them. 1. Reduction by the heel in the axilla. The patient lies on a couch, and the operator sits at the edge, and puts his heel (the shoe or boot being previously removed) into the axilla, to press the head of the bone upward and outward, and at the same time pulls the limb downward by means of a towel fastened above the elbow (see fig. in DISLOCATION). 2. Reduction by the knee in the axilla. The patient being seated in a chair, the surgeon places one of his knees in the axilla, resting his foot on the chair. He then puts one hand on the shoulder, to fix the scapula, and with the other depresses the elbow over his knee. There is danger, if an inexpert person undertakes these manipulations, that the bone of the arm may be broken before the dislocation is reduced.

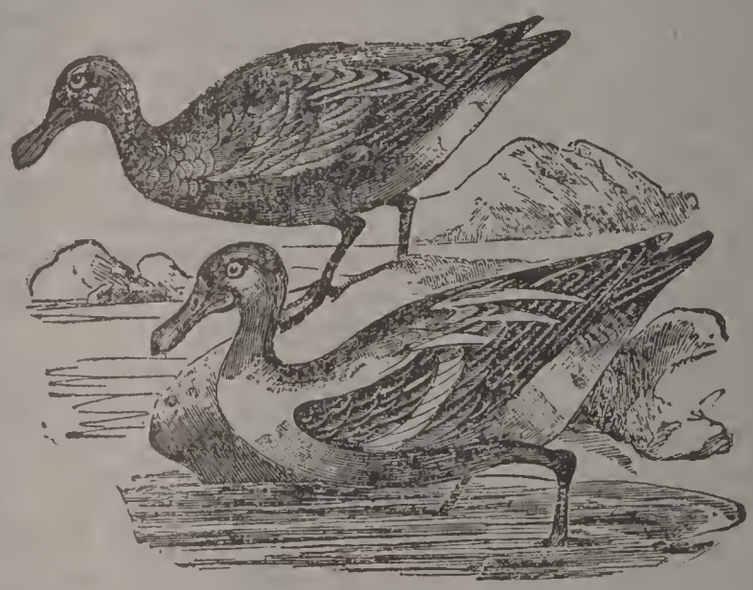
SHOUT, n. *showt* [a form parallel with *hoot:* Low Ger. *schuddern,* to shudder: It. *scioare,* to cry 'shoo' to frighten birds: mod. Ger. *skouzō,* I shout]: a loud burst of voice; a violent and sudden outcry of a multitude of men, expressing applause, triumph, and the like: V. to utter a sudden and loud outcry, as of joy or exultation. SHOUT'ING, imp.: N. the act of crying with sudden outburst of voice; a loud outcry, as of joy or exultation. SHOUT'ED, pp. SHOUT'ER, n. *-ėr,* one who shouts. To SHOUT AT, to deride or revile with shouts.

SHOVE, v. *shŭv* [Dut. *schuiven;* Ger. *schieben;* Dan. *skuffe;* Icel. *skufa,* to push, to draw: AS. *scufan,* to thrust]: to thrust or push; to force or drive forward; to press against; to jostle: N. a thrust; a push. SHOV'ING, imp. SHOVED, pp. *shŭvd.* To SHOVE BY, to push away; to reject. To SHOVE OFF, to move away by a push or a thrust, as a boat from the shore.

SHOVEL, n. *shŭv'l* [Ger. *schaufel;* Dut. *schuffel,* a shovel or similar implement—allied to L. *scabĕrĕ,* to scratch or scrape (see also SHOVE)]: an instrument consisting of a broad iron or wooden blade, more or less hollow, with a long handle, used for shoving and raising loose earth, etc.: V. to take up and throw or heap together with a shovel; to gather roughly; to use a shovel. SHOVELLING, imp. *shŭv'lĭng.* SHOV'ELLED, pp. *-ld.* SHOV'ELFUL, n. *-l-fûl,* as much as a shovel will hold. SHOV'ELFULS, plu. SHOV'ELLER, n. *-ėr,* one who shovels; a species of duck, having a spoon-like bill (see below). SHOVELBOARD, a game played by sliding metal pieces at a mark along a board.

SHOV'ELLER (*Spatula clypeata*): genus of ducks of the section having no lobe or pendant membrane on the hind toe, and remarkable for the expansion of the end of the mandibles in adult birds, particularly of the upper mandible. The lamellæ of the mandibles are long and very delicate. The legs are placed near the centre of the body, so that these birds walk more easily than many ducks. The common shoveller (*S. clypeata*) is smaller than

the wild duck, but rather larger than the widgeon. The S. is a winter visitant of Britain, but not very common. It is widely distributed over Europe, Asia, and in N. America, where it is most often seen in the s. and w. parts of the United States. Its flesh is very highly esteemed. A species of S. is found in Australia.



Shoveller, female and male (*Spatula clypeata*).

SHOW, v. *shō* [AS. *sceawian;* Dut. *schouwen*, to look, to inspect: Ger. *schauen*, to look: Dan. *skue*, to behold, to view]: to present to view; to make or enable to see or know; to reveal; to give proof of; to publish; to teach, instruct, or inform; to prove; to point out; to guide; to explain; to confer or bestow; to afford; to appear or be in appearance; to become well or ill: N. a sight or spectacle; exhibition, as a cattle or agricultural show; something exhibited for money; superficial appearance; ostentatious display; hypocritical pretense; public appearance; semblance. SHOW'ING, imp.: N. demonstration; exhibition. SHOWED, pt. *shōd*. SHOWN, pp. *shōn*. SHOWY, a. *shō'ĭ*, gaudy; making a great show. SHOW'ILY, ad. *-ĭ-lĭ*. SHOW'INESS, n. *-nĕs*, the state or quality of being showy; pompousness. SHOW-BILL, a printed advertisement in large letters, exhibited in a shop-window. SHOW-BREAD, usually SHEW-, among the *anc. Jews*, the loaves of bread placed weekly on the golden table in the sanctuary. SHOW-CASE, a case with a glass cover, in which articles of value are exhibited for sale. SHOWMAN, one who exhibits a show. SHOW-ROOM, a room where a tradesman or manufacturer displays his goods. To SHOW FORTH, to manifest. To SHOW OFF, to exhibit ostentatiously; to set off; to display one's self. To SHOW UP, to expose. SHOW OF HANDS, in *public assemblies*, hands raised up to signify a vote. DUMB-SHOW, action by representation.—SYN. of 'show, v.': to exhibit; display; prove; publish; proclaim; inform; teach; conduct; offer; afford; explain; expound; discover; appear; look; demonstrate; indicate; evince; argue; manifest,—of 'show, n.': spectacle; appearance; display; semblance; likeness; speciousness:

plausibility; exhibition; pomp; phantom; representation, sight; ostentation; parade;—of 'showy': gaudy; splendid; gay; stately; pompous; ostentatious; fine; gorgeous; grand; magnificent; sumptuous.

SHOW'-BREAD: see SHEW-BREAD.

SHOWER, n. *show'r* [Goth. *skura*, a storm. Dut. *schoer;* Sw. *skur;* Icel. *skúr*, a shower: Ger. *schauer*, a shower]: a fall of rain of short duration; a copious fall or supply of anything: V. to water copiously as with rain, to pour down; to scatter in abundance; to bestow liberally; to wet or soak with rain. SHOW'ERING, imp. SHOWERED, pp. *show'rd.* SHOWERY, a. *show'rĭ*, abounding in frequent falls of rain. SHOW'ERINESS, n. *-ĭ-nĕs*, the state of being showery. SHOW'ERLESS, a. *-lĕs*, without showers. SHOWER-BATH, an apparatus for pouring upon the body a shower of water.

SHOWERS OF FISHES: rare phenomena noticed in different parts of the world. A shower of small three-spined sticklebacks fell near Merthyr-Tydvil in Wales, sprinkling the ground and house-tops over several sq. miles. The fish were alive when they fell; yet if caught up by a whirlwind from any of the brackish ponds near the sea, in which this species of fish abounds, they must have been conveyed through the air almost 30 m. A similar instance occurred at Torrens, in the isle of Mull, in which herrings were found strewed on a hill 500 yards from the sea, and 100 ft. above it.

Showers of fishes are much more frequent in those tropical countries where violent storms, sudden gusts of wind, and whirlwinds are most common. In India, a shower of fishes varying from a pound and a half to three lbs. in weight has been known to fall. Sometimes the fishes are living, more frequently they are dead, and sometimes dry or putrefying. They are always of kinds abundant in the waters of the neighborhood; and it cannot be doubted that they are carried up into the air by violent winds or whirlwinds: though they sometimes fall at a considerable distance from any water which could supply them. The sudden reappearance of fresh-water fishes in ponds which have been dried up for months in tropical countries is often popularly ascribed to their falling from the clouds; but the truth is, that they have been buried in the mud below, existing probably in a state analogous to that of animals in cold climates during hibernation. A pool, the bottom of which has long been dry, and on which grass has grown and cattle have walked, is again filled with fishes in a few hours after it is filled with water.

SHOWILY, SHOWINESS, SHOWY, SHOWN: see under SHOW.

SHOWT'L: Indian name for SEWELLEL (q. v.).

SHRANK, v. *shrăngk:* pt. of SHRINK, which see.

SHRAPNEL-SHELL, n. *shrăp'nĕl-* [so named from the inventor, Gen. *Shrapnel*]: in *mil.*, a spherical case filled with musket-balls, and containing a bursting charge of powder (see SHELL, in Gunnery).

SHRED, n. *shrĕd* [O.Dut. *schroode*, a bit of paper: Ger. *schrot*, a piece, shred: AS. *screadian*, to shred; *screade*, a piece, strip]: a long narrow piece torn off; a fragment; a strip: V. to tear or cut off into long narrow pieces, as cloth. SHRED'DING, imp.: N. the act of cutting into shreds; that which is cut or torn off; a fragment. SHRED, pt. pp. *shrĕd*. SHRED'LESS, a. *-lĕs*, having no shreds. SHRED'DY, a. *-dĭ*, consisting of shreds or fragments. A THING OF SHREDS AND PATCHES, applied to anything that is patched, unconnected, or not original, as a book.

SHREVE, *shrēv*, HENRY MILLER: inventor: 1785, Oct. 21—1854, Mar. 6; b. Burlington co., N. J. From boyhood he was interested in navigation. He was the first to ascend the Mississippi to Louisville in a steam vessel, and built the steamboat *Washington* on improved plans of his own. This involved him in a suit with Robert Fulton, which was maintained in his favor. He was supt. of western river improvements 1826–41; opened the Red river for navigation 1,200 m. by removing a great accumulation of logs and driftwood which obstructed the river 160 m.; built a boat for removing snags from the Ohio river, and invented a battering ram for harbor defense. He died at St. Louis.

SHREVEPORT, *shrēv'port:* city, port of delivery, and cap. of Caddo parish, La.; on Red river, and on the Texas and Pacific, the St. Louis Arkansas and Texas, the Shreveport and Houston, and the Queen and Crescent Route railroads; 40 m. e. of Marshall, Tex., 325 m. n.w. of New Orleans. It is at the head of low-water navigation on the Red river, on which it has a frontage of nearly 2 m., extends back from the river 1½ m., and is in one of the most noted cotton-growing regions of the country. For many years its chief industry was handling cotton, receiving and shipping more than 100,000 bales annually; but within a few years it has developed considerable cattle trade and important manufactures. It ships largely by rail and water, having direct steamboat communication with New Orleans, and its location in the extreme n.w. corner of the state makes it the distributing point of a large territory. In 1890 the city contained 12 churches, 5 public schools, 4 seminaries and colleges, 2 large hotels and several small ones, State Charity Hospital, U. S. Marine Hospital, electric light and gas works, improved water and sewerage systems, electric and horse street railroads, opera-house (cost $55,000), and Board of Trade and Cotton Exchange buildings. The assessed valuation of real property was $2,349,750; personal $1,500,000. There were 2 nat. banks (cap. $800,000), 1 incorp. bank ($200,000), 1 private bank, 2 daily and 2 weekly newspapers, and a home fire insurance com. (cap. $200,000). The industries included 2 cotton compresses ($50,000 eh.), cotton-seed oil mill ($200,000), cotton-gin manu. and foundry ($20,000), boiler-works, cotton-compress manufacturing works. In 1902 there were 10 public schools, 3 nat. banks (cap. $500,000), 3 daily and 5 weekly newspapers. The total assessed valuation of property was $6,561,189; bonded debt Feb., 1903, $197,000. The site of S. was given by the

Caddo Indians to Larkin Edwards, a white benefactor, 1835, and in the following year he sold it to a syndicate, who obtained a city charter 1839.—Pop. (1890) 11,979; (1900) 16,013; (1910) 28,015.

SHREW, n. *shrô* [OE. *schrewid*, wicked: Ger. *schroff*, rugged, rude: prov. Ger. *schrô*, rough to the touch, poor: Low Ger. *schræ*, bare]: a peevish, turbulent, vexatious woman; a scold; a virago; in *OE.*, used in the general sense of a bad man. SHREW'ISH, a. *-ĭsh*, peevish; vixenish; petulantly clamorous. SHREW'ISHLY, ad. *-lĭ*. SHREW'ISHNESS, n. *-nĕs*, the state of being shrewish; frowardness, petulance.

SHREW, or SHREWMOUSE, n. *shrô'mows* [AS. *screawa*, a shrewmouse: akin to OE. *schrewid*, wicked, as the bite of the animal was supposed to be fatal—see also SHREW 1]: term designating small quadruped of family *Sorecidæ;* often called shrewmouse, and popularly confounded with mice and rats, but really very different, having insectivorous and not rodent teeth. The head is very long; the snout elongated, attenuated, and capable of being moved about; the eyes small; the tail long: both body and tail covered with fine short hair; the feet have a broad sole and 5 toes. The genus *Neosorex* has comparatively short ears; in the genus *Sorex*, the most common, the ears are large. The smallest of Amer. mammals is *S. personatus;* other species occur mostly on the Pacific slope.—The MOLE SHREW (*Blarina talpoides*), with large fore-feet, is found

Common Shrew (*Sorex vulgaris*).

from Canada to the Gulf.—The COMMON S. of Britain (*S.* or *Corsira vulgaris*) was, until recently, confounded with *S. araneus*, a species common in continental Europe. It is nearly 2½ inches in length from the snout to the root of the tail, the length of which is about 1¾ inches. It abounds in dry fields, gardens, and hedge-banks; feeding chiefly on insects and worms, for which it grubs with its long snout among the roots of herbage. It burrows, and makes long *runs* just under the surface of the ground. It is an excessively pugnacious little animal, and the males have fierce combats in spring, in which many are killed. Cats kill the S., but do not often eat it, probably on account of its strong musky smell, but it is the prey of weasels, hawks, owls, and shrikes. Harmless and inoffensive as it is, it has long

been regarded with dread and aversion by the vulgar. (See White's *Natural History of Selborne.*)—Another even smaller species, *S. pygmæus*, is found in Ireland, where it is called the Shrew Mole.—The WATER S. (*S. fodiens* or *Crossopus fodiens*) is larger than the Common S., being fully 3 inches long, and the tail 2 inches. It is of blackish brown color, gray or white on the underparts. It burrows in the banks of streams, and is very aquatic in its habits. It is found in many parts of Great Britain.—Some of the Indian species of S. attain a much larger size, e.g., one called Musk Rat (q.v.). There is an Italian species, smallest of all known Mammalia; only about 1½ inch in length, exclusive of the tail, which measures about one inch.

SHREWD, a. *shrôd* [from Eng. SHREW: *shrewd*, in the sense of sharp, sagacious, arises from the same feeling which has given to the term *silly*, originally signifying innocent, blessed, the sense *foolish*—the *wicked man* being regarded as intelligent and sharp-sighted, the *good* as simple and easily deceived—see Wedgwood]. sagacious; acute; of nice discernment; sly; artful; in *OE.*, pinching; painful; mischievous. SHREWD'LY, ad. *-lĭ*, in a shrewd manner; with a good guess; in *OE.*, mischievously; destructively; vexatiously. SHREWD'NESS, n. *-nĕs*, the quality or state of being shrewd; discrimination; sagacity; in *OE.*, sly cunning; archness.—SYN. of 'shrewd': acute; keen; sagacious; sharp; critical; astute; penetrating; artful; subtle; discerning.

SHREW MOLE (*Scalops*): genus of insectivorous mammalia, of family *Talpidæ*, and very nearly allied to the moles. There are 6 incisors, 2 canine teeth, 8 false molars, and 6 true molars in each jaw. The ear is destitute of auricle; the eyes are very small, and much concealed: the feet 5-toed, the fore-feet large, as in the mole. The whole figure, also the habits, resemble those of the mole.—There are several species, all natives of N. America.

SHREWSBURY, *shrôz'ber-ĭ*: a township in Monmouth Co., N. J.; on the Shrewsbury river and the N. J. Central railroad; 5 m. n.w. of Long Branch. The village contains 2 churches, a seminary for young ladies, a savings bank, and several factories. Previous to 1890 it contained the larger village of Red Bank. Pop. of tp., excluding Red Bank (1900) 3,842; (1910) 3,238.

SHREWSBURY, *shrôz'bĕr-ĭ*: parliamentary and municipal borough and market town, cap. of Shropshire; on the Severn, by which it is nearly surrounded, 163 m. n.n.w. of London, by the London and Northwestern railway. It is irregular in plan, contains many inferior houses, partly of timber, but often very picturesque. In the modern quarters, the houses are handsome and regular. Two bridges, the 'English' and the 'Welsh,' cross the Severn and connect the town with the suburbs of Abbey-Foregate and Coleham on the e. and Frankwell on the w. To the n. is the other suburb of Castle Foregate. The town contains interesting remains of the ancient walls, the castle, two monasteries, and a Benedictine abbey. The remains of the Abbey

Church now form the church of Holy Cross. There are other ecclesiastical edifices, a free school, with an income from endowment of £3,100 a year, and 22 exhibitions to the universities; a number of other important schools, institutes, hospitals, etc. The Town and County Hall, the Public Rooms, a handsome Greek structure, and the Market-hall, erected 1867–8, in the Italian style, are notable. S. carries on manufactures of linen thread, canvas, and iron wares, and there is a salmon fishery on the Severn. The Brawn and 'Shrewsbury Cakes' made here have long been held in esteem.—Pop. (1871) 23,406; (1881) 26,478; (1891) 26,967; (1901) 30,000.

S., called by the Welsh Pengwern, was named by the Anglo-Saxons *Scrobbes-Byrig*, and of this the modern name is a corruption. The town connects itself intimately with the history of the country from the 12th to the 17th c. It was taken by Llewellyn the Great, Prince of North Wales, 1215, during the disturbances between King John and the barons; and 1403, Henry IV. here defeated the insurgent Percies and their allies with great slaughter. It was taken by the parliamentarians 1644.

SHRIEK, v. *shrēk* [Dan. *skrige;* Sw. *skrika*, to cry, to scream: W. *ysgrêch*, a scream: Ger. *schreien*, to cry out (see SCREECH)]: to utter a sharp shrill cry; to scream, as in sudden fright, or in anguish: N. a shrill piercing cry, as of sudden terror or anguish. SHRIEK'ING, imp.: ADJ. crying out with a shrill voice: N. a crying out with a shrill voice. SHRIEKED, pp. *shrēkt.*

SHRIEVALTY, n. *shrēv'ăl-tĭ* [see SHERIFF]: another spelling of SHERIFFALTY; the office or jurisdiction of a sheriff.

SHRIFT: see under SHRIVE.

SHRIKE, n. *shrīk*, or BUTCHER-BIRD [from SHRIEK, which see: Dan. *skrika*, a jay], (*Lanius*): genus of birds of family *Laniadæ* (q.v.), approaching more nearly in character to the *Falconidæ* than any other of that family; having a short, thick, and compressed bill, the upper mandible curved, hooked at the tip, and furnished with a prominent tooth, the base of the bill beset with hairs, which point forward. The species are numerous, most of them natives of warm climates, though some occur in more northern regions. They prey on insects and small birds, and have a remarkable habit of impaling their prey on thorns; so that the nest of a S. may be discovered by the numerous insects impaled in the neighborhood of it. Shrikes kill and impale many insects which they never eat, leaving them to dry in the sun; and in confinement they make use for this purpose of a nail, if provided with it, or stick portions of their food between the wires of the cage. They can imitate in some degree the notes of many birds, particularly those which are the utterance of distress, and they seem to make use of this power in order to attract birds within their reach. The most common European species is the RED-BACKED S. (*L. collurio*), only about 7½ inches in length, about a third of the length being formed by the

tail, which is square at the end. Insects are the chief food of this bird, but it preys also on small birds, young frogs, and even young pheasants.—The GREAT GRAY S., or SENTINEL S. (*L. excubitor*), known in the United States as the Butcher-bird, is about the size of a thrush. It is com-

Great Gray Shrike (*Lanius excubitor*).

mon in parts of Europe, and is found also in Asia and N. America. It was formerly used by falconers in catching hawks, of which it is greatly afraid, screaming loudly on their approach: the falconer waited in concealment, after fastening some pigeons and a S. to the ground, until the

Forked-tail Crested Shrike (*Dicrurus cristatus*).

scream of the S. gave him notice to pull the string of his net.—Another species, common in western states, is *L. excubitoroides*.

SHRILL, a. *shrĭl* [Scot. *skirl*, to cry with a sharp voice: Norw. *skryla*, to cry in a high note, as children: Low Ger. *schrell*, sharp in sound]: sharp and piercing, applied to sound: V. in *OE.*, to pierce the ear with sharp quick sounds; to express in a shrill manner. SHRILL'ING imp.: ADJ. sounding shrill. SHRILLED, pp. *shrĭld*. SHRILL'Y, ad. *-ĭ*. SHRILL'NESS, n. *-nĕs*, the state of being shrill or acute in sound; sharpness of the voice.

SHRIMP, n. *shrĭmp* [Dut. *krimpen*, to contract or diminish: AS. *scrimman*, to wither or dry up: Ger. *schrumpfen*, to shrivel: Scot. *scrimp*, to deal sparingly with one, scanty]: a small shell-fish, allied to the lobster; anything very small of its kind; a little wrinkled man. SHRIMP'ER, n. *-er*, one who catches shrimps with a dredge-net on a beach. SHRIMP-NET, net fastened on a pole, used for catching shrimps.—*Shrimp* (*Crangon*) is genus of crustaceans of sub-order *Decapoda*, family *Crangonidæ*, allied to lobsters, cray-fish, and prawns. The form is elongated, tapering, and arched as if hunch-backed. The claws are not large, the fixed finger merely a small tooth, the movable finger hook-shaped. The beak is very short, affording a ready distinction from prawns. The whole structure is very delicate, almost translucent; and the colors are such that the creature may readily escape observation, whether resting on a sandy bottom, or swimming through the water. The quick darting movements of shrimps, like short leaps, however, betray them to one who looks attentively into a pool left by the retiring tide on a sandy shore. When alarmed, they bury themselves in the sand, by a peculiar movement of their fanlike tail fin.—The COMMON S. (*C. vulgaris*) is very abundant on the British coasts, and very generally elsewhere on those of Europe, wherever the shore is sandy. It is about two inches long, of greenish-gray color, dotted with brown. It is in great esteem as an article of food, and is taken generally by nets in the form of a wide-mouthed bag, stretched by means of a short cross-beam at the end of a pole, and pushed along by the shrimper wading to the knees. Sometimes a net of larger size is dragged along by two boats. This species, after boiling, is brown in color.—Another species, *Pandalus annulicornis*, is bright red after boiling.—Other species of S. seem equally fit for the table: they belong rather to more southern climates. Shrimps are interesting inmates of the aquarium.—The name S. is extended to several related crustaceans, in the United States. See PRAWN.

SHRINE, n. *shrīn* [AS. *scrin*; Ger. *schrein*; F. *écrin*; L. *scrinium*, a cabinet or place to keep anything in]: a case

Portable Shrine, Malmesbury Abbey.

or place where sacred things are deposited; a reliquary; a decorated tomb; a sacred place; an altar: V. to enshrine. SHRIN'ING, imp. SHRINED, pp. *shrīnd*.

SHRINK, v. *shrĭngk* [AS. *scrincan*, to contract from drought: O.Flem. *schrincken*, to contract: Dut. *schrikken*, to start back: Norw. *skrekka*, to shrink, as cloth: Sw. *skrynka* a wrinkle, a pucker]: to draw spontaneously or be drawn into less size or bulk; to shrivel; to cause to contract; to decline action; to recoil, as from fear or disgust: to withdraw; to make to contract or dwindle: N. contraction; withdrawing from fear or disgust. SHRINK ING, imp. N. a drawing into less compass or bulk; the process of damping or wetting woolen cloth to cause it to contract before being cut and made into garments; act of drawing back through fear or disgust. SHRANK, pt. *shrăngk*, did shrink. SHRUNK, pt. pp. *shrŭngk*. SHRUNKEN, pp. *shrŭngk'n:* ADJ. contracted; shrivelled. SHRINKINGLY, ad. *shrĭngk'ĭng-lĭ*. SHRINK'AGE, n. *-āj*, a contraction into a less bulk or compass; loss by gradual evaporation or absorption, as a liquid in casks. SHRINK'ER, n. *-ĕr*, one who shrinks.

SHRIVE, v. *shrīv* [probably from L. *scribĕrĕ*, to write, to draw up a law or decree: Sw. *skrift*, shrift: Icel. *skript*, reprimand, punishment: Low Ger. *schreve*, a line: AS. *scrifan*, to shrive, to enjoin, to judge]: to make confession to a priest; to hear a confession, with the imposition of penance, and the giving of absolution following thereon. SHRI'VING, imp.: N. a confession to a priest. SHRIVED, pt. *shrīvd*, or SHROVE, pt. *shrōv*, did shrive. SHRIVEN, pp. *shrĭv'n*. SHRIVER, n. *shrī'vĕr*, one who shrives; a confessor. SHRIFT, n. *shrĭft* [AS. *scrift*]: confession made to a priest, generally applied to the confession of a dying person; absolution. SHORT SHRIFT, said of persons executed shortly after condemnation; *colloquially*, little mercy.

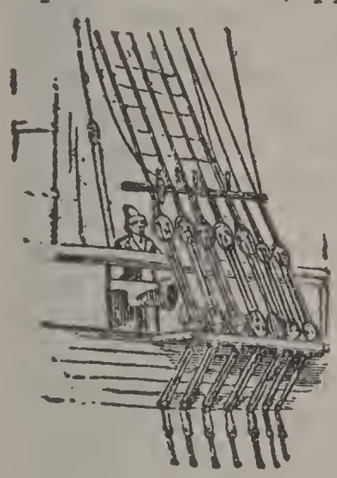
SHRIVEL, v. *shrĭv'l* [Sw. *skrynka*, a wrinkle: Icel. *skrafa*, to creak like dry things: prov. Eng. *shravel*, dry fagot-wood]: to cause to contract into wrinkles; to contract into wrinkles; to crumple up. SHRIV'ELLING, imp. SHRIV'ELLED, pp. *-ld:* ADJ. contracted into wrinkles.

SHROFF, n. *shrŏf* [Ar. *sarraf*]: in *E. Indies*, a banker or money-changer. SHROFF'AGE, n. *-āj*, the examination of coins, and the separation of the good from the debased.

SHROPSHIRE, *shrŏp'shĕr*, or SALOP, *sā'lop:* frontier county in w. England, bounded w. by n. Wales, e. by Stafford and Worcester; 811,167 acres: cap. Shrewsbury. The Severn, principal river, enters the county from Montgomeryshire, about 12 m. w. of Shrewsbury, flows generally s.e. 70 m. across the county, is navigable throughout, and is joined by two considerable tributaries, the Tern and Teme. N. and n.e. of the Severn, the county is generally level and under tillage; s. and s.e., it is hilly and mountainous, and here cattle breeding is extensive. A breed of horned sheep is peculiar to this county. More than three-fourths of the whole acreage are arable, or in pasture and meadow. The soil is generally fertile and well cultivated, though there are extensive tracts of waste land. S. is remarkable for mineral wealth. The coal,

iron, copper, and lead fields of Coalbrookdale, Snedshill, Ketly, etc., are very productive. Several thousand persons are employed in raising coal, iron, stone, and lime, and in the iron manufacture.—Pop. of county (1871) 248,111; (1881) 248,014; (1891) 236,324; (1901) 239,297.

SHROUD, n. *shrowd* [AS. *scrud*, what is cut up, a garment, clothing: Dan. and Sw. *skrud*, dress: Icel. *skrud*, ornament, clothing; *skryda*, to adorn, to clothe: closely allied to SHRED]: that which clothes, covers, or shelters a covering; the dress of a corpse; a winding-sheet: V. to cover; to veil; to shelter from danger; to take shelter; to conceal; to envelop; to dress for the grave. SHROUD'ING, imp. SHROUD'ED, pp. SHROUD'LESS, a. *-lĕs*, without a shroud. SHROUDS, n. plu. in a *ship*, a range of long and strong ropes, partly forming a rope-ladder extending from the head of a lower mast on each side, and fastened to the sides of the ship, for the lateral support of the mast. They are crossed by thinner ropes, called ratlines, to form steps or ladders. The topmast shrouds in ship-rigged vessels are similar, except that they terminate in a row of dead-eyes on the outside of the tops.—The term shrouds is applied also to sail-ropes, and sometimes to the sails themselves.



Shrouds.

SHROVE, a. *shrōv* [from SHRIVE, which see]: a word only used in composition, as SHROVETIDE, n. *-tīd* [AS. *tid*, time, season]: (see below). SHROVE-TUESDAY, n. confession-time; the day immediately preceding the first day of Lent or Ash-Wednesday. SHROVING, n. *shrō'vĭng*, the festivity of Shrovetide.

SHROVE'TIDE (literally 'confession-time'): name given to the days immediately preceding Ash-Wednesday, which (as indeed the whole period after Septuagesima Sunday appears to have been) were anciently days of preparation for the penitential time of Lent; the chief part of which preparation consisted in receiving the sacrament of penance, i.e., in 'being shriven,' or confessing. In the modern discipline of the Rom. Cath. Church a trace of this is preserved, and in many countries the time of the confession which precedes the paschal or Easter communion begins from Shrovetide. These days were sometimes called Fasting-tide or Fast-mass, names still retained in parts of Great Britain. The name S. was retained in England after the Reformation, though the practice of 'shriving' was abandoned. The precept of 'shriving' having been fulfilled, the faithful, on the eve of beginning the Lent, were indulged with permission to give themselves up to amusements and to festive celebrations, of which the counterpart is still seen in the continental carnival. In England, the pastimes of football, cock-fighting, bull-baiting, etc., were, till a late period,

recognized usages of S.; and the festive banquets of the day are still represented by the pancakes and fritters from which Pancake Tuesday took its name, and by the 'collops' which gave the title to Collop Monday. These usages are gradually disappearing. See MARDI GRAS.

SHRUB, n. *shrŭb* [Ar. *shurb*, a drink: akin to *sherbet* (see SYRUP)]: kind of liqueur made chiefly in the W. Indies, composed of lime or lemon-juice and syrup or sugar, to which a small portion of rum is added; other flavoring materials are used occasionally.

SHRUB, n. *shrŭb* [AS. *scrob*, a shrub: Norw. *skrubba*, the dwarf cornel-tree: prov. Dan. *skrub*, a bush: Dan. *skrubbet*, rough, rugged: akin to Eng. *scrub*]: woody plant of less size than a tree; a low dwarf tree; plant with woody stem and branches like a tree, but not generally exceeding 20 ft. in height (usually much less), and branching near the root, so as to have no main stem of considerable height. A shrub of small size and much branched is often called a *bush*. There is no important botanical distinction between trees and shrubs, and the same genus often includes species of both kinds. Many shrubs, e.g., honeysuckle, are climbers.

In English law, whoever plants a shrub thereby makes it a part of the soil, and it becomes a kind of fixture, incapable of being removed by tenants, unless the tenant is a nurseryman, who makes a business of planting and removing shrubs. Decisions in the United States are to the same general effect, though the law seems not quite clear on all points. SHRUB'LESS, a. *-lĕs*, wanting in shrubs. SHRUB'BERY, n. *-bĕr-ĭ*, plantation of shrubs. SHRUB'BY, a. *-bĭ*, full of shrubs; consisting of shrubs. SHRUB'BINESS, n. *-bĭ-nĕs*, state or quality of being shrubby.

SHRUB'BERIES, ORNAMENTAL: plantations of shrubs for beautifying lawns or grounds in the vicinity of houses. The larger number of shrubs set for this purpose present their finest appearance in summer; but in recent years the list has been greatly enlarged, and now embraces many plants highly ornamental in winter. Where one of the leading designs of S. is to separate the lawn from the adjoining field, evergreens are very desirable. But for merely ornamental purposes, mixed S. of evergreens and deciduous shrubs are much to be preferred. Forest trees properly have no place in S., though they are sometimes planted with a view to their removal when they become so large as to make them undesirable. One of the principal difficulties in forming S. is to arrange for a proper number of shrubs. If only enough are set to give a good appearance when they are grown, they will, for some years, appear very open and imperfect. On the other hand, if enough shrubs are planted to give the grounds a pleasing appearance at once, there will soon be an overcrowded look, detracting greatly from their beauty. These evils are to be obviated by planting duplicates, and as the shrubs increase in size removing those not required. Careful pruning must be given to keep the strong-growing

shrubs within bounds, and flowering shrubs should be cut back after the flowers have fallen. Shrubs which are hardy in the climate in which they are to be grown should be selected; those which bloom should be so chosen as to secure both a succession of flowers and contrasting colors; and a proper proportion of the classes desirable for flowers, and of those prized for foliage, should be maintained.

SHRUG, n. *shrŭg* [Sw. *skrukka*, to huddle one's self up: Dan. *skrugge*, to stoop: Norw. *skrukka*, a wrinkle]: a drawing up of the shoulders, expressive of doubt, dissatisfaction, or contempt: V. to contract or draw up the shoulders in order to express doubt, contempt, etc. SHRUG'GING, imp. SHRUGGED, pp. *shrŭgd.*

SHRUNK, v. *shrŭngk*, or SHRUNKEN, *shrŭngk'n:* pp. of SHRINK, which see.

SHUBRICK, *shū'brĭk*, WILLIAM BRANFORD: naval officer: 1790, Oct. 31—1874, May 27; b. Bull's Island, S. C. In 1805 he entered Harvard Coll., but left it in 1806, having been appointed a midshipman, and assigned to the sloop-of-war *Wasp.* He was in active service during the war of 1812, serving on the *Hornet*, *Constellation*, and *Constitution.* When he returned to the U. S. 1815, May, after 8 years of distinguished services, he was voted a sword by his native state, and a medal by congress, and was included in the vote of thanks to Stewart and his officers. He was promoted commander 1820, capt. 1831. At the beginning of the Mexican war, at his own request for sea-service, he was put in command of the Pacific squadron, and sailed from Boston 1846, Aug., and reached the Pacific coast 1847, Jan. He took the cities of Mazatlan, Guaymas, La Paz, and San Blas, and with his naval forces held them during the war. In 1858 he commanded a fleet of 19 vessels sent to demand redress of Paraguay for firing on the U. S steamer *Waterwitch.* He arrived at Asuncion 1859, Jan. 25, and compelled the S. Amer. republic to apologize and pay a money indemnity. He served as chief of the bureau of construction 1853, and was chairman of the light-house board 1854–58, and again 1860–70. He was retired 1861, but continued chairman of the light-house board. 1862, July 16, he was commissioned rear admiral after 55 years of almost constant service. He died in Washington.

SHUCK, n. *shŭk* [prob. connected with *shock*]: a shell or covering; a husk or pod, especially the shell or covering of a nut, as a walnut, etc.; the case or covering of the larvæ of certain insects.

SHUDDER, n. *shŭd'dĕr* [O. Dut. *schudden;* Ger. *schüttern*, to shiver]: a cold tremor; a shaking with fear or horror; V. to feel a cold tremor from fear, horror, or aversion: to quake; to tremble. SHUD'DERING, imp.: N. a quaking with terror or aversion. SHUD'DERED, pp. *-dĕrd.* SHUD'DERINGLY, ad. *-lĭ.*

SHUDE, n. *shôd* [probably from SHED 3, which see]: the husks of rice, and certain other refuse, employed in adulterating oil-cake.

SHUE: see SHOO.

SHUFELDT, *shū'fĕlt*, ROBERT WILSON: naval officer. b. Red Hook, N. Y., 1822, Feb. 21. He entered the U. S. navy as midshipman 1839; was promoted master and lieut. 1853, but resigned the next year, and was connected with various steamship lines. At the breaking out of the civil war he was appointed consul-gen. to Havana; was reinstated in the navy 1862, and commanded the *Conemaugh* in the Charleston blockade, and the *Boteus* of the eastern Gulf squadron. After the war he served in the E. India and the Asiatic fleets. He was commissioned capt. 1869, commodore 1876, and was chief of the bureau of equipment and recruiting in the navy dept. 1875–78. In 1878–80 he sailed round the world in the *Ticonderoga*, touching at many points in Africa, the E. Indies, and Asia with the object of promoting American commerce. He was connected with the Amer. legation at Pekin, China, 1881–2; was promoted rear-admiral 1883; and retired 1884. He d. 1895, Nov. 7.

SHUFFLE, v. *shŭf'fl* [Bav. *schufeln*, to go along scraping the ground with one's feet: O. Dut. *schuffelen*, to drive by kicks and shoves (see SCUFFLE 1)]: to shove one way and the other; to mix by rapidly changing one thing into the place of another; to throw or change a pack of cards into a new arrangement; to shift ground; to evade fair questions; to play mean tricks; to prevaricate; to quibble; to move with an irregular gait; to move the feet backward and forward with a scraping noise; in *OE.*, to remove or introduce with tricky or fraudulent tumult: N. the act of mixing by changing places; an evasion; an artifice. SHUF'FLING, imp. *-flĭng:* N. act of one who shuffles; trick; artifice; an irregular gait: ADJ. prevaricating; evasive; moving with irregular gait. SHUF'FLED, pp. *-fld.* SHUF'FLINGLY, ad. *-flĭng lĭ.* SHUF'FLER, n. *-flĕr*, one who shuffles; one who prevaricates. To SHUFFLE OFF, to put off trickishly; to move off with irregular gait; to push or shove aside. To SHUFFLE OUT OF, to evade a duty, burden, etc. To SHUFFLE UP, to form or throw together hastily or confusedly.—SYN. of 'shuffle, v.': to quibble; evade; equivocate; prevaricate; sophisticate; cavil; shift; struggle; confuse.

SHUGSHUT, *shôg'shôt:* small town of Turkey in Asia, in Anatolia, on the left bank of the Sakaria, 95 m. in direct line s.e. of Constantinople. On an adjacent hill is the tomb of Othman (q.v.), founder of the Ottoman dynasty. The tomb, resembling the handsomest and most ancient of the Turkish sepulchres at Constantinople, stands amid a grove of cypresses and evergreen oaks.—Pop. estimated about 8,000.

SHUMAC, n. *shū'măk:* see SUMACH.

SHUMALA'RI: see HIMÁLAYA.

SHUMLA, *shôm'lâ:* city of Bulgaria, about half-way along the line of railway which connects Rustchuk and Varna, 60 m. s.s.w. of Silistria. It is bounded n. and w. by mountains, and s. and e. by an undulating plain furrowed by valleys that extend n. to the Danube. Its situation is pleasing, and the character and distribution of its buildings give it a picturesque appearance. The roads from the former Turkish fortresses on the lower Danube and in the Dobrudscha on the n., and from the passes of the Eastern Balkan on the s., converge on S., giving it importance as a strategic position. Under the Turkish sway, S. was one of their most important strongholds, with very strong and extensive fortifications; and possessed a citadel, arsenal, capacious magazines, large and numerous barracks, and a military hospital. The plain around was studded with detached forts. S. was attacked in vain by the Russians 1774, 1810, and 1828. The Congress of Berlin, which established Bulgaria as an autonomous principality 1878, resolved that the fortifications of S. and other Bulgarian towns should be destroyed.—In S. are nearly 40 mosques. Wine and silk are largely produced; there are manufactures of copper. tin, and leather. Pop. (1881) 23,093, and still comprising large proportion of Turks or Mohammedans; (1888) 23,161; (1900) 22,928.

SHUN, v. *shŭn* [AS. *scunian*, to avoid: Icel. *skunaa*; Dan. *skynde*, to hurry]: to keep clear of; to avoid; to turn away from; to endeavor to escape; to neglect; not to mix or associate with. SHUN'NING, imp. SHUNNED, pp. *shŭnd*. SHUN'LESS, a. inevitable; unavoidable.

SHUNT, v. *shŭnt* [a corruption of *shun*, in its provincial sense of to shove on one side: OHG. *scuntan*, to urge on]: in *railway management*, to remove a wagon, a carriage, or a train, from one line of rails on to another; to turn a train into a siding; to delay; to put off unnecessarily and vexatiously. SHUNT'ING, imp.: N. the act of removing wagons, etc., from one line of rails on to another. SHUNT'ED, pp. SHUNT'ER, n. *-ér*, a railway servant employed in shunting. SHUNT GUN, a rifled firearm having two sets of grooves, the shot being passed down the one set, and passing out, when fired off, by the other.

SHUNT SYSTEM OF RIFLING: ingenious arrangement for securing the accurate centring of a projectile discharged from a rifled cannon. To obtain precision of aim and range, it is absolutely essential that the axis of a projectile should, at the moment of discharge, coincide exactly with the axis of the bore. This can scarcely be obtained unless the shot fits with extreme tightness into the gun; and if it does so, and the gun is a muzzle-loader, it is scarcely possible to load it. In the ordinary gun the projectile is smaller than the bore, so as to pass readily into the gun, resting, of course, on the bottom of the bore. The projectile is covered with a soft metal, e.g., lead, which expands with the pressure behind, and fits the shot tight into the grooves; but from the fact that it rested (at the beginning of the expansion) on the bottom of the

bore, the axis of the shot is always below the axis of the bore, causing deviation from aim. To obviate this, Sir William Armstrong designed the 'shunt' system, which in some respects was found effective. A 'shunt-gun' has two sets of grooves, one down which the studs on the projectile are passed in loading, and another, not so deep, along which the studs pass in discharging, thus fitting tightly in the shallower rifling of the double groove, the ball being shunted from one set to the other at the bottom of the bore by the explosion of the charge.

The shunt system has been found complicated, and liable to damage projectile and gun; it has therefore been superseded. See RIFLED ARMS.

SHURTLEFF, ERNEST WARBURTON, D.D.: American poet and clergyman: b. Boston, Mass., 1862, Apr. 4. He was graduated from Andover Theological Seminary in 1888, held Congregational pastorates at Palmer and Plymouth, Mass., from 1899-1905 was pastor of the First Congregationalist Church in Minneapolis, from 1905 to 1906 was pastor at Frankfort-on-the-Main, Germany, and since 1906 has been in charge of the Students' Atelier Reunions, Paris, France. He has published *Poems* (1883); *Easter Gleams* (1883); *Shadow of the Angel* (1896); etc.

SHURTLEFF, *shêrt'lĕf*, NATHANIEL BRADSTREET, M.D.: 1810, June 29—1874, Oct. 17; b. Boston. He graduated from Harvard College 1831, and from the medical dept. 1834, but engaged in literary pursuits, and was interested especially in antiquarian studies. Though tracing his descent from 11 of the *Mayflower* Pilgrims, he was a devoted Roman Catholic. He was mayor of Boston 1868-70. Besides many genealogical sketches, he wrote *Epitome of Phrenology* (1835); *Perpetual Calendar for Old and New Style* (1848); *Passengers of the Mayflower in 1620* (1849); *Records of the Governor of and Company of the Massachusetts Bay in New England*, 1628-1686, 5 vols. (1853-4); and edited with David Pulsifer *Records of the Colony of New Plymouth in New England*, 11 vols. (1855-61).

SHURTLEFF, ROSWELL MORSE: American artist: b. Rindge, N. H., 1838, June 14. He was graduated at Dartmouth College in 1851; worked at lithography and drawing on wood till 1861, when he enlisted with the 99th New York Volunteers, of which he became lieutenant and adjutant. He was the first Union officer wounded and taken prisoner in the war, 1861, July 19, and was not released until after nearly eight months' imprisonment. Illustration of books and magazines absorbed his efforts for many years, but he began to paint in 1870 and has executed numerous landscapes in both water and oil, largely transcripts of scenery in the Adirondacks.

SHUSTAR, *shôs'têr:* city of Persia, in Khuzistan, on the Karun, 30 m. e.s.e. of Dizful, at the foot of a range

of sandstone hills. In the early part of the 19th century it was an important town, the cap. of the province; but it was nearly depopulated by an epidemic 1832, and was much damaged by inundation 1840. On a height stands the castle, commanded, however, by a loftier elevation. The walls have been allowed to fall, and a fourth part of the town is in ruins. Mackenzie found the town, 1875, wretchedly decayed and filthy. The houses are of stone, with underground rooms for refuge from the intense summer heat. Customs are collected here, but the trade is small. Pop. 6,000—8,000.

SHURTLEFF COLLEGE: located at Upper Alton, Ill. It was founded by the Baptists and first opened to students in 1827. The organization includes a preparatory department, a collegiate department, and a Divinity School. Normal, commercial, music, and art courses are also provided. There are two regular college courses leading to the degrees of A.B. and B.S., respectively. The theological course is two years in length. All departments, including the theological department, are coeducational; in 1902-3 there was one woman in the Divinity School. The library contains 1,000 volumes; and the students number 170, of whom 80 are women.

SHUT, v. *shŭt* [Dut. *schutten,* to shut in, lock up; *schieten,* to shoot, to drive forward; *schutdeur,* a sluice-gate: Low Ger. *schott,* a bolt: Bav. *schütten,* to fence round: Ger. *schützen,* to protect]: to close so as to prevent entrance or exit; to close or stop up for defense or security; to forbid entrance into; to contract, as the hand; not to keep expanded; to close itself; to be closed. SHUT'TING, imp. SHUT, pt. pp. *shŭt.* SHUT'TER, n. *-tĕr,* a cover for a window or opening. SHUT'TERED, a. *-tĕrd,* furnished with a shutter or with shutters. TO SHUT IN, to confine; to inclose. TO SHUT OFF, to exclude; to prevent the passage of, as steam. TO SHUT OUT, to exclude; to deny admission to. TO SHUT UP, to close; to make fast the entrance of; to confine.—SYN. of 'shut, v.': to close; inclose; confine; prohibit; bar; exclude; contract.

SHUT-IN SOCIETY: an American organization established in order to soften the lot of invalids by supplying various desirable objects which might otherwise be unattainable. Local societies, besides supplying their sick members with fruit, flowers, reading material, medicines, and nourishing foods, also undertake to supply easy-chairs and other helps to convalescence.

SHUT'TER, MARION DANIEL: American Universalist clergyman: b. New Philadelphia, O., 1853, Aug. 4. He was graduated from the University of Wooster, O., in 1876, from the Baptist Theological Seminary, Chicago, in 1861, and was ordained in the Baptist ministry. He was in charge of the Olivet Baptist Church, Minneapolis, for some years, but afterward changed his views and became pastor of the First Universalist Church there. He has

published: *Wit and Humor of the Bible* (1892); *Justice and Mercy* (1894); *Applied Evolution* (1900); *Child of Nature* (1895); *How the Preachers Pray* (1900); *Life of James Harvey Tuttle* (1905); etc.

SHUTTLE, n. *shŭl'tl* [AS. *scyttel*, a lock, a bar—from *sceotan*, to shoot: Norw. *skutul*, or *skyt*, a shuttle (see SHOOT)]: implement by which the thread is shot to and fro in weaving (see LOOM). SHUTTLE-BOX, case at the end of the race of a weaver's loom to receive the shuttle after having passed through the thread. SHUTTLECOCK [*cock*, supposed corruption of *cork*: according to Skeat, probably called *cock* from being stuck with feathers and flying through the air]: ornamental cork stuck with feathers, beaten forward and backward by a battledoor in play. SHUTTLE-RACE, a sort of shelf or ledge in a loom along which the shuttle passes.

SHUTTLE: an instrument used by weavers for shooting or passing the thread of the weft from one side of the web to the other, between the threads of the warp. It is a boat-shaped piece of wood which carries a bobbin or cop containing the yarn of the weft or woof. The shuttle sometimes has wheels to facilitate its motion.

In a sewing machine, the sliding thread-holder which carries the lower thread between the needle and the upper thread, to make a lock stitch. In hydraulic engineering, the gate which opens to allow the water to flow onto a wheel. That side of the wheel which receives the water is known as the shuttle side.

SHWAN-PAN, n. *shwŏn-păn*: a calculating instr. of the Chinese, similar to the Roman abacus.

SHY, a. *shĭ* [Ger. *scheu*, timorous; *scheuen*, to be afraid of: Dan. *sky*, shy, skittish: Sw. *skygg*, timid]: that is fearful of near approach; reserved; not familiar; avoiding free intercourse; wary; cautious; bashful: V. to start suddenly aside, as a horse; to take fright. SHY'ING, imp.: N. act of starting suddenly aside, as a horse from fear. SHIED, pp. *shīd*. SHIER, n. *shī'ĕr*, one who shies. SHYLY, ad. *shī'lĭ*. SHY'NESS, n. *-nĕs*, fear of near approach; reserve; unsociableness.—SYN. of 'shy, a.': bashful; reserved; coy; timid; cautious; wary; suspicious; chary; jealous.

SHY, v. *shī* [Dan. *skieve*, to deviate, swerve (see also SKEW)]: to have a fling at; to try to hit: N. a fling at; a side-throw. SHY'ING, imp. SHIED, pp. *shīd*.

SHYLOCK: the leading character in *The Merchant of Venice*, which has been made the subject of much critical study as to the origin of the play and its plot. The story appears in various forms, with a non-Jew often as the principal figure in its early versions, German, Latin, etc. As early as 1587, in Leti's *Vita de Sixto Quinto*, Venice, the harsh creditor is a Christian, Paolo Mari Sechi, and the debtor, a Jew, Sansone Geneda, who bet a pound of flesh that Drake had not captured Santo

Domingo, Haiti, in 1585. He lost, and Sechi, insisting on the forfeit, Sixtus V. decided that both creditor and debtor should be sentenced to the galleys or pay the penalty of two thousand scadi. Probable sources of Shakespeare's plot are also attributed to an English version (1558) of Ser Giovanni Fiorentino's *Pecorone* of the 14th c. and to the ballad of *Gernutus the Jew,* printed in Percy's *Reliques.* Now in 1579 Stephen Gosson, in his *School of Abuses* noticed a lost play called *The Jew;* two years before Robinson translated the *Gesta Romanorum,* containing the germ of Shakespeare's casket story. In 1584 a Jewish usurper appears in *The Three Ladies of London,* who is the reverse of the Shylock type and 'freely resigns both interest and principal to prevent his debtor, a wily Christian merchant, from abjuring his Christianity.' (Herford's introduction to *The Merchant of Venice,* Eversley Edition, 11, page 126.)

The change in the character in Shakspeare's play, which was entered in the *Stationers' Register* in July, 1598, was attributed by Frederick Hawkins in *The Theatre* (Nov. 1879) and by Sidney Lee in *The Gentleman's Magazine* (Feb. 1880) to the trial and execution of Dr. Rodrigo Lopez, Queen Elizabeth's state physician, on the charge of being connected with a plot for poisoning her, which caused much public odium against the Jews, some of whom had reëntered England. His chief enemy, like Shylock's, was called Antonio. It is recorded by Henslow that three months after the execution of Lopez he brought out a *Venesyon Comedy,* probably as Herford states 'a further réchauffe on the bond story'; in 1584 there were many repetitions of *The Jew* and Marlowe's *Rich Jew of Malta,* whose Barabas was a monster indeed. It has been supposed that Shakspeare was induced by the interest which the trial created to revise the play referred to by Cosson in 1579, based upon *Il Pecorone* and draw the Jew after, in some respects, the popular notion of his day. It is to be added that Shylock was played as a comic character until Edmund Keane gave it a serious setting, in which later actors have followed him in varied style, Irving being probably the most successful. In 1907, protests against the adoption of *The Merchant of Venice* in the list of plays for the study of English in American high schools, were made, and with success, by Jews in Galveston, El Paso, Cleveland and elsewhere, on the plea that young readers are apt to imbibe a spirit of prejudice against their Jewish classmates. See Philipson, *The Jew in English Fiction.*

SI, *sē:* in *music,* the seventh note of the scale = B.

SIA INDIANS: a Pueblo tribe of New Mexico, living on the Jemez river, near Bernalillo. They were formerly of great importance, but in 1689 they were assaulted by the Spaniards and the tribe decimated. Its present population is about 125.

SIALAGOGUE, SIALAGOGIC: see SIALOGOGUE.

SIALOGOGUE, n. *sī-ăl ō-gŏg*, or SIAL'AGOGUE, n. *-ă-gŏg* [F. *sialagogue*—from Gr. *sialon*, saliva; *agōgos*, leading—from *agō*, I lead]: medicine which increases the flow of saliva. SIAL'OGOG'IC, a. *-gŏj'ĭk*, promoting the flow of saliva.—*Sialogogue* denotes a substance which, by local stimulation, increases the secretion from the Salivary Glands (q.v.). Among such substances are Horse-radish root, Mezereon bark, and Pellitory root. Horse-radish root when chewed produces copious flow of saliva, and has been found useful in aiding deglutition in paralysis of the tongue. If Mezereon bark is used in the same way, the saliva should be frequently ejected, because of the acrid properties which it absorbs from the drug. Pellitory root is the best of this class of remedies. Fragments weighing half a dram to a dram may be frequently chewed to increase the flow of saliva in facial neuralgia, rheumatism of the muscles of mastication, and paralysis of the tongue.

SIAM, *sī'am* or *sē'am* (native name *Thái* = the Free, or *Muang Thái* = the Kingdom of the Free): kingdom, chief state of Indo-China; bounded s. by the Gulf of Siam and the Malay Peninsula (q.v.). On the w., n., and e., the frontier-line is ill defined and fluctuating, owing to many tribes being only partially under subjection, and to the constant wars of aggrandizement between S. and the Malayan and Burmese races on the w., and the Cambodian and Cochin-Chinese races on the east. According to a recent account, the country lies in lat. 4°—21° n., long. 96°—102° e.; is 1,200 m. in length, about 350 m. in extreme breadth; area calculated (1902) 236,000 sq. m.; pop. esti. 4 to 5 millions. The kingdom consists of 39 provinces, each governed by a Phraya, or functionary of the highest rank. There are numerous districts beyond the limits of the kingdom proper, as the Laos, Malayan, and Cambodian dependencies, which are more or less under subjection to S., and pay tribute generally once in three years. S. itself pays tribute to China, but only as a matter of usage and convenience, for it receives from that country more than a return, in the remission of duties on Siamese vessels bound to Chinese ports. Cambodia is between S. on the w. and Cochin-China; and as sovereignty over it has been claimed by both these countries, and as it has been too feeble to resist the claims, it has paid tribute to both. It is now held to be under a French protectorate: see CAMBODIA: COCHIN-CHINA: COCHIN-CHINA, LOWER.

Surface, Hydrography, Coast-line, Soil, and Climate.—The mountains which cover the n. districts, and form natural barriers along its e. and w. frontiers, are branches of the great system of the Himalaya. Though the n. dependencies of S. are mountainous, the kingdom proper is a vast plain, hilly only on its n. frontier. The great river of the country, the Nile of S., is called by foreigners Menam, or, more commonly, Meinam; but the Siamese call all rivers by this name, and distinguish the river by

adding to the name Menam the name of the chief town or village on its banks; thus, Menam Bangkok is the river of Bangkok—that is, the great river of the country, which Europeans and other foreigners have agreed to call Meinam. This river, the great life-sustaining artery of the country, rises among the mountains of the Chinese province of Yunnan, whence it flows s. more than 800 m., and enters by three mouths, 6 to 8 fathoms deep, into the Gulf of Siam, about 30 m. (18 m. in direct line) below Bangkok. It receives a number of important affluents, notably the river Phitsalok, which joins it in lat. about 17° 35′ n. The annual inundation of the Meinam, the occasional non-occurrence of which entails failure on a great portion of the rice-crops, begins in June, and ends in Nov. Impregnated with the rich soil which it brings from the interior, its waters, in Aug., overflow the banks to a height sometimes exceeding six ft. above the ordinary level. The tract of country within the direct influence of the inundations is estimated at 12,000 sq. m.; but, properly speaking, the actual valley of the Meinam, beginning 450 m. above the mouth of that river, with average breadth of 50 m., has area of more than 22,000 sq. m., and forms a tract of country the fertility of which is not exceeded in any other part of the globe. Of the other great rivers, the chief is the Mei-kong, which flows through the e. districts, and is said to be 1,600 m. long. The coast-line, fringing the edge of the Gulf of Siam, may be roughly estimated at 1,100 m., exclusive of minor windings. The principal ports on the coast-line are Paknam (pop. 6,500), defended by three forts; Paklat, a few m. above Paknam (pop. 7,000), defended by a fort on each side of the river; Meklong, at the mouth of the river of the same name, long. 100° 10′ e., a beautiful city, with floating bazaars, fine pagodas and gardens (pop. 10,000); Chantaburi, long. about 103° e., near the mouth of a river which, though short, fertilizes with its inundations a considerable district, a place of active trade with China and Cochin-China (pop. 6,000); and Bangplasoi, 27 m. e.s.e. of Paknam, engaged in a profitable fishery and in agriculture (pop. 6,000). The breadth of the Malayan Peninsula, in lat. 11° n., is only 50 m., and here two streams, one flowing w. to the Bay of Bengal, the other e. to the Gulf of Siam, offer facilities for construction of a ship-canal, for, their sources being near each other, about 27 m. of canalization are all that would be required to connect them, and thus form a sea-way across the peninsula, which would shorten the voyage between India and eastern Asia by many days, and often by weeks. The estimated cost is $100,000,000; but the approaches through the river-mouths are intricate and unsatisfactory.—The climate of S. is, for a tropical region, salubrious; the resident missionaries speak highly in its favor. The mean temperature at Bangkok, for a series of eight years, was 81° 14′; the maximum heat, within the same space, was 97°, minimum 54°. Hurricanes and typhoons are almost unknown in S., though it is visited every year by the s.w. and n.e. monsoons—the

former bringing clouds, thunder-storms, and rain, the latter bringing refreshing weather.

Agriculture, Flora, and Fauna.—In S., few of the instruments in use in scientific agriculture are known; and in many parts of the country, 1855, the ground was prepared for seed by turning herds of buffaloes into the fields to trample down the weeds and move the soil, and afterward by harrowing the ground with thorny shrubs. But the soil is so rich that the smallest outlay of capital and labor is rewarded by abundant harvests. A much more advanced system of agriculture has recently been introduced, and the quantity of agricultural products exported has greatly increased. Rice and sugar are principal crops. Of other products, the chief are *Aquila*, or eagle-wood, renowned for its perfume, and extensively used on that account at funerals, marriages, and other ceremonies in e. Asia; gutta-percha; cardamoms; gambege; bamboo; the rattan; valuable palms; the guava; mango; daurien, esteemed the king of fruits in S.; the mangosteen; and many other fruit and other trees, including teak and a variety of valuable ship and house timbers. Among the animals, the most famous is the elephant, which abounds in the forests. It is against the law of S. to kill elephants, as these animals are considered the property of the king; nevertheless many are slain for their tusks. A variety of this animal, said to be peculiar to S., is the white elephant, not really white, but of light mahogany color: this animal is held in the highest veneration, the cause of which is, that he is 'supposed to be the incarnation of some future Buddha, and will therefore bring blessings on the country which possesses so great a treasure.' He is fed on fresh grass, and sugar-canes and plantains served in rich dishes, is covered with ornaments, inhabits a building attached to the palace, enjoys the rank of nobility, and is tended by a staff of officers, guards, valets, etc. Tigers abound, especially in the Laos country in the n.; tiger-cats, rhinoceroses, boars, wild pigs, elks, and deer of many kinds tenant the woods. Crocodiles, lizards, and serpents of various kinds are numerous. Excellent fish are found on the coasts and in the rivers.

Minerals.—Gold is found among the mountains, and silver in combination with other metals; copper, tin, lead, and iron are abundant, and are extensively worked by the Chinese. Precious stones are in great number and variety.

Manufactures.—Vases, urns, and other vessels, in the manufacture of which gold is embossed on silver, are made here in great numbers, and have an oriental celebrity. Gold-beating, iron-founding, and manufactures of fine cloth, glass wares, and pottery are carried on.

Commerce, Exports, and Imports.—In former times, Bangkok (q.v.), the cap., was the most commercial city e. of the Cape of Good Hope, after Calcutta and Canton; and 60 British ships were engaged in trade with the river Meinam. But such had been the influence of bad legisla-

INDIA AND SIAM.
SCALE OF STATUTE MILES.
0 50 100 200 300 400
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R., McN. & Co. Engr's Chi.
70°
80°
Longitude East from Greenwich.
90°
100°
ARABIAN SEA
INDIAN OCEAN
BAY OF BENGAL
GULF OF SIAM
BRITISH INDIA
BALUCHISTAN
AFGHANISTAN
KAFIRISTAN
KASHMIR
PUNJAB
GREAT RAJPUTANA DESERT
NORTH WESTERN PROV.
CENTRAL INDIA
CENTRAL PROV.
BERAR
HYDERABAD
MADRAS
BURMA
SHAN STATES
LAOS STATES
SIAM
BHOTAN
NEPAL
KHATMANDO
CALCUTTA
BOMBAY
LACCADIVE ISLANDS
ANDAMAN IS.
NICOBAR ISLANDS
CEYLON
COLOMBO
ADAMS PEAK
BANGKOK
TROPIC OF CANCER
SANDY DESERT
Mouths of the Indus River
Mouths of the Ganges and Brahmaputra
Mouths of the Mahanuddy
Mouths of the Godaveri
Mouths of the Kistna
Mouths of the Irawaddy
Ten Degree Channel
Nine Degree Channel
Eight Degree Channel
Palk Strait
Gulf of Cutch
Gulf of Manaar
Gulf of Martaban
Gulf of Siam
Longitude East from Greenwich

tion, and such the destructive progress of monoploy, that the foreign trade 1855 had become reduced almost to nothing. Sir John Bowring, Brit. plenipotentiary, arriving in S., negotiated a treaty of friendship and commerce with the Siamese rulers 1855, which provides that British subjects are permitted to trade freely in all seaports of S., may purchase lands, houses, etc., and may profess the Christian religion undisturbed. By this treaty, all monopolies are rescinded, British traders purchasing directly from the producer, and selling directly to the purchaser, without the interference of any third party. Export-duties are levied on all goods that leave the country, but they pay one impost only, whether this be levied under the name of inland tax, transit-duty, or duty on exportation. Prior to 1856 the British arrivals amounted to only 12 per annum; in 1858 they amounted to 81 vessels; and in 1881 the entries at the port of Bangkok, centre of the foreign trade of S., included 268 British vessels (of a total of 524 vessels), of 110,625 tons. Total exports, 1876-80, had an annual value of from $8,000,000 to $11,000,000; imports $5,000,000 to $6,500,000. The trade with Britain fluctuates in an extraordinary manner; the chief articles exported were rice and sugar, and principal imports were iron and machinery. In 1889 the imports were $7,743,229; exports $11,111,320; revenue about $9,720,000; expenditure within revenue; no public debt. The val. of im., 1904, chiefly treasure, cotton goods and opium, was $21,819,830; of ex., chiefly rice and teak, $27,250,875.

Inhabitants and Government.—The Siamese proper, that is, the Thái race, form about a third of the entire population. 'They are gentle, timid, careless, and almost passionless.' They differ in several respects from many eastern nations. Lying, though frequently resorted to as a protection against injustice and oppression, is not a national characteristic. The Siamese are inclined to be idle, inconstant, and exacting; but they are sincere, very affectionate in their domestic relations, witty in conversation, and, like the Chinese, expert in mimicry. About a third of the whole population are Chinese, who are great emigrants, but who, wherever they go, preserve their own language, customs, costume, habits, and social organization. There are, it is estimated, 1,500,000 Chinese in S.; in Bangkok alone 100,000. All the active business of the country is in their hands. The Laos people (see SHAN STATES) also are very numerous in the country, and there are considerable numbers of Malays and Cambodians. The religion of the Siamese is Buddhism (q.v.), which inculcates the highest veneration for life in whatever form. A Siamese will not kill vermin or serpents; and the tameness of many creatures that in Europe flee from the presence of man is observed by all strangers. The use of Betel (q.v.) is almost universal. All the *belles* of S. stain their teeth black.

The government is an absolute and hereditary monarchy, and there are two kings. The First King is the actual monarch; the Second King, who receives about one-third of the revenue and has an army of 2,000 men, seems to occupy the place of first counselor, and is invariably consulted by the first king before any decisive step in administration of affairs.

There are 5,000 Buddhist temples in S., and more than 60,000 priests. At Bangkok, the capital, there are several schools for tuition of the Siamese in English. The revenue of S. is largely derived from an opium tax, a tax on spirits, a tax on lotteries or gambling, custom duties, the land tax, leases of forests and mines, and the postal, telegraph and railroad systems. The standing army is now 5,000 men. The S. navy consists of 22 vessels over 100 tons, 10 of them being over 500 tons. The rice export, 1904, was 845,084 tons, valued at $22,502,350. There are 26 rice mills in Bangkok. Great forests in the upper part of S. are leased by English investors. In 1904, 77,531 tons of teakwood were exported; 738 vessels, of an aggregate tonnage exceeding 660,000, cleared from S. ports in 1904. The total length of railroad in S. is 350 m. There are 2,900 m. of telegraph wire, and 150 post offices, sending out 630,000 letters and receiving 950,000.

History.—The annals of the Siamese begin about five centuries B.C. But nothing authentic is known of the history of the country till 1350, in which year Ayuthia, the former cap., was founded. Cambodia was conquered 1532, and in the same century the Siamese dominion extended to Singapore. The present dynasty ascended the throne 1782. There have been Prot. and Rom. Cath. missionaries in S. since 1828. Under the auspices of the Calcutta Auxiliary Bible Soc., the New Test. has been translated into Siamese, and was pub. 1846.—See Bowring's *Siam* (1857); works by Pallegoix, Bréhan, Reclus (1883); by the Germans Bastian and Scherzer; by the Americans Bacon and Vincent; and Karl Bock's *Temples and Elephants* (1883).

SI'AM, GULF OF: important arm of the Chinese Sea, bounded n. and w. by Siam, s.w. by the Malay Peninsula, n.e. by Cambodia. At its entrance between Cambodia Point and the Peninsula of Patani, on the Malay Peninsula, it is 235 m. wide; and from a line between these points it extends inland n.w. to the mouth of the Meinam, 450 m. Four great rivers, navigable to a considerable distance from their mouths, and the chief of which is the Meinam (see SIAM), fall into the gulf. It is unvisited by hurricanes, and shipwrecks here are rare.

SIAMESE TWINS, *sī-a-mēz* or *-mēs:* two individuals, Eng and Chang; born of Chinese parents in Siam 1811; died 1874; having their bodies united by a band of flesh stretching from the end of one breast-bone to the same place in the opposite twin. The survival to advanced life of such a *lusus naturæ* makes this one of the most remark-

able cases on record. A union of the bodies of twins by various parts is not unusual (see MONSTROSITY). Ambrose Paré has depicted instances of union by the back, belly, and forehead. The Siamese Twins were purchased of their mother at Meklong, a city of Siam, and were brought to the United States by Capt. Coffin and Mr. Hunter 1829. On examination, the connecting band seemed to have united them at first face to face, but constant traction had so changed its direction that they stood partially side by side. Its length above was about 2 in.; below, nearly 4; from above downward it measured 3 in., and its greatest thickness was 1½ in. It was covered with skin; and when the centre was touched, both felt it; but on touching either side of the median line, only the nearest individual was sensible to it.

After realizing a competence by exhibition of themselves in various countries of Europe, the twins settled in North Carolina, where they were married to two sisters, and had offspring. Owing to domestic quarrels, however, two houses were found necessary—each living with his wife a week at a time alternately. Impoverished by the civil war, they again made the tour of Europe, and exhibited themselves to the public.

SIANG-TAN, China: a busy commercial town of the province of Hu-nan, on the Siang-kiang, midway between Chang-sha and Heng-chan, on one of the great national roads, and water-routes, connecting with Peking and Canton. Pop. est. 100,000.

SIANG-YANG, China: a *fu* or departmental city of the province of Hu-peh, at the confluence of the Tang and Han rivers, opposite its important commercial suburb Fancheng, 100 m. n. of I-chang. Siang-yang is the Saianfu of Marco Polo, which with the aid offered by that traveler's father and uncle to Kublai Khan, succumbed to the Mongolian conqueror, after a determined resistance 1268-73. Pop. est. 60,000.

SIARGAO: an island of the Philippines, 20 m. from the n.e. coast of Mindanao; length 20 m., n. and s.; width, 14 m.; area, 176 sq.m. It is traversed from n. to s. by a mountain range, the highest peaks of which are in the s. The northern, southern, and western coasts are paralleled by a reef lying 3 m. off shore; the ports on the coast are reached by natural channels through this reef. The island has seven towns, several hamlets, and a considerable rural population.

SIB, or SIBB, a. *sĭb* [Goth, *sibja,* relationship: OHG. *sibba,* affinity: AS. *sib,* kindred, peace]: in *OE.* and *Scot.,* related; of kin.

SIBALÓN, Philippines: pueblo, province of Antique, island of Panay, on the Sibalón river, 6 m. from its mouth, 10 m. n.e. of San José de Buenavista. Pop 11,680.

SIBERIA, *sī-bē'rĭ-a:* vast territory in n. Asia, belonging to Russia. In England the name is generally applied to all the Russian possessions in Asia, except the Transcaucasian and Armenian provinces: S. so defined is bounded n. by the Arctic Ocean; e. by the seas of Kamtchatka, Okhotsk, and Japan, arms of the Pacific Ocean; w. by the Ural Mountains, Ural river, and Caspian Sea. The s. boundary is made to include the recent Russian acquisition in Turkestan, and runs from Lake Issyk Kul n.n.e., then e. by Kiahta to the Argun river, which it follows to the Amur; the latter it follows to long. 135° e., where it trends s.w., ascending the Usuri tributary 200 m., then running straight to the sea at the n. frontier of Corea. In the official language of Russia, however, S. has not such extent. The Russian possessions in Turkestan form a separate division under the name CENTRAL ASIA, and to this portion of the empire the govts. Akmollinsk, Semipalatinsk, Turgai, and Uralsk are now attached. Geographically speaking, these govts. belong to S.; as do also considerable areas e. of the Ural Mts., which for administrative purposes form part of the European govts. of Perm and Orenburg.

The total area of Siberia proper, including the island of Sakhalin, in the north Pacific, ceded by Japan in 1876, is 4,833,496 square miles; pop. (1897) 5,727,090. Since the extension of the Russian dominions in central Asia a territorial division called Central Asia has been formed, partly taken from what was formerly Siberia, partly formed of newly-acquired territory, and comprising the geographical regions sub-divided into provinces, of Northern Caucasia, and Trans-Caucasia, forming the Caucasus, area 180,843 sq. m., pop. 9,248,695; the Steppes, area 755,793 sq. m., pop. 2,461,278; Turkestan 409,434 sq. m.; pop. 4,888,183; Trans-Caspian, 214,237 sq. m., pop. 372,193; giving with the Caspian Sea, area 169,381 sq. m., a total area for Asiatic Russia of 6,564,778 sq. m., pop. 22,697,469. Siberia, strictly so-called, is therefore of smaller extent than formerly. The n. and e. shores are very irregular in form, jutting out frequently into bold peninsulas and promontories, and indented with numerous immense inlets, chief of which are the estuaries of the Obi (575 m. in length) and of the Yenisei, the Gulf of Anadir, and the Sea of Okhotsk. All the island groups n. of S., and since 1875 the whole of Sakhalin or Saghalien on the e. coast, belong to S.; whereas since 1875 all the Kurile Islands are Japanese. The Liakhoff group, near the mouth of the Lena, consists of three islands, 60 to 100 m. long by 20 to 40 broad, and of numberless islets; they are completely barren, and present in their soil and subsoil alternate layers of sand and ice, in which are imbedded the remains of animals. The northermost point of Siberia and of the old world is Cape Chelyuskin, or Northeast Cape. Prof. Nordenskjöld, who 1878-9 sailed along the whole coast of S. from e. to w., found Cape Chelyuskin to

be in lat. 77° 41′ n. A country of such vast extent as S. (greatly larger than Europe) must necessarily have great varieties of climate; accordingly we find in the n. regions, much of which lie far within the Arctic circle, an extensive tract bordering on the ocean, composed of swamp, moorland, and mossy flats, covered with snow and ice for half of the year, and even during the greatest heats of summer released from its icy bonds only to the depth of a few inches below the surface. The ocean, its n. boundary, is frozen for miles seaward during more than half the year, and during the remaining months the numberless icebergs and floes which crowd the sea, and continually come into collision, render the navigation so dangerous that no complete hydrographic survey of the coast has yet been made. On the s. boundary of this semi-barren zone, stunted, misshapen bushes and trees are found; and as we advance s., vegetation appears in the form of extensive forests of birch, fir, and larch, which clothe the plains and hill-sides, and are interspersed with stretches of pasture of moderate quality. After crossing the parallel of lat. 64° n. in west S., and that of lat. 61° n. in east S., the more hardy cereals, barley, oats, and rye, begin to appear, and the soil increases in fertility, sometimes to an extraordinary extent, thick woods of Siberian cedar and other trees clothe the mountain-sides, and the valleys, especially along the banks of rivers, are under cultivation. The whole of western S. is one great plain, sloping from its s. boundary, where the average elevation is 2,000 ft., northward to the Arctic ocean, except the small corner in the s.w., which is drained into the Caspian and Aral seas. The fertility of a great portion of the govts. of Tobolsk and Tomsk, especially of the *Baraba* and *Ishim* steppes, is proverbial, and they are the great granaries of Russia and n. Europe. But the warmest and perhaps most fertile part of western S. is the valley of the Yenisei, n. of the Sayansk Mts. Eastern S. is more hilly and less fertile than the w. portion, but the valleys and hill-sides afford good pasture. Four-fifths of S. is drained by the three immense rivers Obi (q.v.), Yenisei, and Lena (q.v.), and by a number of smaller rivers, all flowing to the Arctic Ocean. S. has a large number of lakes, some of which are little else than salt-marshes; the largest are Lake Baikal (q.v.) and Lake Balkash (q.v.). The chief mountain range of S. is the Altai chain, which forms the s. boundary toward Mongolia, and ramifies e. and n. from the region of Lake Baikal, covering a large portion of the surface of eastern S. East of Baikal, the continuation of the Altai is rather a lofty table-land, running to Behring Strait, with many nearly parallel ridges: this plateau is the 'Great Divide' between the Lena and the Amur. The best-defined and loftiest range is the Yablonovoi Mts., or section of the Stanovoi Mts., culminating on the frontier in a peak 8,370 ft. high. Farther e. is the Stanovoi proper. Lofty mountain chains traverse the island of Saghalien and the peninsula of Kamtchatka, in which are 21 active volcanoes —the loftiest, Kliutshewsker, 15,000 ft. Among wild

animals of S. are the reindeer in the n. flats and on the high mountains of the s.; the arctic or black fox and white bear in the n.; the sable, ermine, marmot, marten, squirrel, Caspian antelope, and wild sheep—all in the s.; and the lynx, wolf, wild boar, and glutton are generally diffused. Camels are found among the Kirghis, with the broad-tailed sheep, the Russian sheep also being domesticated in S.; and horses of good quality, an inferior sort of cattle of the Russian breed, and a large wolfish looking dog, used chiefly to draw sledges, complete the list of domestic animals. Fresh and salt water fish abound, and feathered game is plentiful in the south. The mineral wealth is great: gold, silver, copper, and lead are found in all the mountainous districts on the w. and s.; platinum, iron, and precious stones, including diamonds, are found on the e. slopes of the Ural; zinc, antimony, arsenic, plumbago, and valuable emerald and topaz mines are worked in the districts n. of the Amur; and porphyry, malachite, jasper, and salt (from the steppes) are common. The great majority of the inhabitants of the central and w. provinces are Russians and Poles, or of Russian and Polish descent, and these have been sent to the country either as exiles, on account of political or criminal offenses, or as govt. colonies. The most abandoned class of exiles are kept to hard labor in the mines; others are put to less laborious but still compulsory work; a third portion are settled in specified districts, under surveillance of the police, and allowed to employ themselves as they choose. This last class employ themselves chiefly in trapping those animals whose skins and furs are valuable articles of trade. In the n.w. are found the Samoieds, and adjoining them the Ostiaks, both of whom live by hunting and fishing alone. In the s. are the nomad tribes of the Kirghis (q.v.) and Kalmucks (q.v.), both cattle-breeding peoples, though the latter have now partially adopted a settled mode of life, and manufacture iron and gunpowder. Next to them, on the borders of Manchuria, are the Buriats, a people of Mongol origin, the most numerous tribe in S.; to the n. of whom are the Yakuts and Tunguses, of Tartar origin, who are spread over the whole of eastern S. from the town of Irkutsk to the Stanovoi range, and live mostly by hunting. The Tchuktchis, an Esquimau race, and the Koriaks inhabit the n.e. corner, and the Manchus are the population of the Amur territory. Manufactures are unimportant and confined to the principal towns; the barter-trade in European goods is carried on at Obdorsk, Ostrovnoe, Yakutsk, and Petropavlovsk; and the transit-trade with China through Kiahta (q.v.), imports from China being tea of the finest quality, sugar, silk, cotton, wool, grain, fruits, etc.; and exports to that country, cotton and woolen cloths, linen, furs and skins, leather, and articles of gold and silver. The exports to Russia are the natural produce of the country, and are transported w. to the frontier by alternate land and river carriage to Tobolsk, thence over the Ural Mountains to Perm. Reindeer sledges are the usual means of transport in winter. Fairs are held at stated periods in certain locali-

ties, and much of the trade of the country is there transacted. The chief towns in Siberia proper (1905) are Tobolsk, pop. 21,401; Tjumen, 29,651; Tomsk, 63,533; Irkutsk, 49,106.

S. seems to have been made known to the Russians first by a merchant named Anika Stroganoff; and soon afterward the conquest of western S. was effected by the Cossack Vassili Yedmak, an absconded criminal, at the head of a numerous band of wild followers. After Yermak's death 1584, the Russians pursued their conquests eastward, founding Tomsk 1604; and though they often experienced serious reverses, their progress was rapid, the Sea of Okhotsk being reached 1639, and Irkutsk founded 1661. Frequent disturbances have occurred between the Russians and the Chinese and Tartars, which have resulted in the extension southward of the Siberian boundary into Manchuria and Turkestan (q.v.). In 1845 the left bank of the Amur became Russian. In 1858 the frontier was extended along the seaboard s. of the river to the frontier of Corea. The Russians have now a large number of steamers on the Amur. During the last 250 years, more than 1,000,000 exiles have gone to S., if we include women and children accompanying their banished relatives. The yearly average is 8,000 or 9,000. Accounts as to their treatment vary greatly; some affirming that all are fairly used; some, that they, even political exiles, are very harshly dealt with. Recent statements by the accomplished and observant explorer George Kennan (q.v.) throw a fearful light on the sufferings which the Russian govt. either inflicts or permits on the part of multitudes of its state prisoners whom it condemns to Siberian exile.—The manufacturing industries of S. are developing slowly; its mines are extensively wrought; but agriculture is practiced only by the Russian settlers. In 1891 the govt. fixed the route of a great railroad, which was begun in May of that year, and completed in Dec., 1901. The line connects at Samara with the line passing through Moscow from St. Petersburg, crosses the Ural Mountains between Ufa and Zlatooust, passes through Omsk, Tomsk, Irkutsk to Kottomangoo on the Ural, thence s.e. to Khabarovka on the Ural, and then nearly s.w. to Vladivostok on the Sea of Japan; a branch connects with the commercial terminus, Dalny near Port Arthur. The cost was $172,525,000, the total distance, St. Petersburg to Vladivostok is 6,666 m. This railroad, or that portion of it running through Manchuria to Port Arthur, is now since the Russian defeat, owned and controlled by Japan.—See Eden's *Frozen Asia* (1880); Lansdell's *Through Siberia* (1882); Kennan's *Tent Life in Siberia* (1870), and *Siberia and the Exile System* (2 vols. 1891).

SIBERIAN, a. *sī-bē'rĭ-ăn:* pertaining to *Siberia* or Asiatic Russia; bleak; northern. SIBERIAN DOG, n. variety of the Esquimau dog, of large size and docile temper.

SIBILANT, a. *sĭb'ĭ-lănt* [F. *sibilant*—from L. *sĭbilans* or *sibilan'tem*, hissing; *sibĭlārĕ*, to hiss—from *sibĭlus*, a hissing]: making a hissing sound: N. a letter uttered with a hissing sound, as *s*. SIB'ILANCE, n. *-ĭ-lăns*, or SIB'ILANCY, n. *-ĭ-lăns-ĭ*, the quality or characteristic of being sibilant. SIB'ILA'TION, n. *-lā'shŭn*, utterance with a hissing sound; a hissing sound.

SIBLEY, *sĭb'lĭ*, HENRY HASTINGS, LL.D.: 1811, Feb. 20—1891, Feb. 18; b. Detroit: pioneer and soldier. He received a classical education and began the study of law, but turned to mercantile business at Sault Sainte Marie, and soon afterward entered the service of the American Fur Co. at Mackinaw and Fort Snelling, and eventually became a member of the company. He settled in Minn. while it was a territory, and was its delegate in congress 1849-53, and a member of the constitutional convention 1857. On its admission as a state 1858, he was chosen its first governor. In 1862, Aug. and Sep., he commanded the successful expedition against the Sioux Indians, and Sep. 23 was commissioned brigadier-general of volunteers, and later brevetted major-general. In the early days of Minnesota, Gen. Sibley wrote graphic sketches of frontier life for the *Spirit of the Times* and *Turf, Field, and Farm*.

SIB'LEY, HIRAM: financier: 1807, Feb. 6—1888, July 12; b. North Adams, Mass. In early life he was engaged in manufacture of machinery; but was interested in telegraphy, and largely through his efforts congress made an appropriation to assist Morse in his experiments. When telegraphy became a fixed fact, Sibley was among the first to organize a telegraph company. In 1856 he, with a number of other business men, bought up the smaller companies, and consolidated them into what is now the Western Union Telegraph Co., and was its first pres., holding the position many years. He founded the Sibley College of Mechanic Arts of Cornell University, Sibley Hall of the Rochester University, and gave liberally to public and private charities. He died at Rochester, N. Y.

SIB'LEY, JOHN LANGDON: librarian: 1804, Dec. 29—1885, Dec. 9; b. Union, Me. He graduated at Harvard 1825; studied at the divinity school; was assistant librarian 1825-6, again 1841-56; librarian 1856-77; librarian emeritus 1877-85. In 1829 he was ordained pastor of a Unitarian church at Stow, Mass., serving till 1833. In 1837 he became ed. of the *American Magazine of Useful and Entertaining Knowledge*, and later its proprietor. He edited the triennial, quinquennial, and annual catalogues of Harvard, and wrote biographies of early graduates of Harvard. He gave $39,000 to Phillips Exeter Acad. for aid of poor students. He died at Cambridge.

SIBONEY, Cuba: a village 10 m. s.e. of Santiago de Cuba, near which the United States troops disembarked

in the Spanish-American war. It was the scene of a sharp struggle between the American and Spanish forces 1898, June 23. Four troops of Rough Riders, under Colonels Wood and Roosevelt, were ambushed at this point and 16 Americans were killed. Notwithstanding their surprise and losses the Americans charged up the hill with such intrepidity that the Spaniards abandoned their block-house and fortified position, leaving 40 of their dead behind. The village was found to be infested with yellow fever, and in July was burned to the ground at the request of the medical officers.

SIBONGA, Philippines: pueblo, province of Cebú, on the e. coast, 28 m. w. of Cebú, the principal capital. It is on the coast highway, has a good anchorage, and is open to coastwise trade. Pop. 23,455.

SIBUTU: an island of the Tawi Tawi group, Sulu Archipelago, Philippines, 30 m. s.w. of the island of Tawi Tawi; 18 m. long, 2 m. wide; area 36 sq.m. The surface is mostly flat, with a conical hill in the centre rising to the height of 500 ft. It is heavily wooded, and the soil is fertile, but there is no agriculture; there is a transient population of Moro and Sulu fishermen and a small village on the s.e. coast. This island was found to be 9 m. outside the western line of demarcation under the Paris treaty with Spain, and in 1900 was bought (with Cagayan) by the United States for $100,000.

SIBUYAN: an island of the Romblóm group, Philippines, the second largest and most eastern island of the group, 50 m. n. of Panay; area 90 sq.m. It is very mountainous, the highest peak being Mount Sibuyan (6,424 ft.); there are three principal rivers, and a number of smaller rivers and streams which furnish excellent drinking water. The island is heavily wooded, and the soil very fertile, but the inhabitants lack thrift and industry, and no attempt is made to develop their natural resources. Some rice, vegetables, and an inferior quality of tobacco are raised, for home use only. Gold is found in the sands of the Nailog river, and a number of the inhabitants are engaged in placer mining; trepang and tortoise shells are gathered on the coast. Pop. 18,000.

SIBYL, n. *sĭb'ĭl* [L. *sĭbyl'la:* Gr. *sĭbul'la;* according to the old derivation, from *Dios boule*—Doric, *Sios bolla,* will or counsel of God]: name given to certain women who in ancient times and different countries professed to be inspired as prophets: gypsy; fortune-teller. SIB'YLLINE, a. *-lĭn,* uttered or composed by Sibyls; pert. to the Sibyls. SIB'YLLIST, n. *-ĭst,* believer in the Sibylline prophecies.—*Sibyl* is the designation of several supposed prophetic women whose history has come down to us in wholly mythical form. Their number is differently given; Aristophanes and Plato seem to know of one only: so too the author of the Greek work *Thaumasia Akusmata.* Heraclides of Pontus, disciple of Plato, mentions three

—Erythræan, Phrygian, Hellespontine; Pausanias four; later writers give the names of 2, 3, 4, 8, 10, and 12 Sibyls. But in general 10 are reckoned: the Babylonian, Libyan, Delphian, Cimmerian, Erythræan, Samian, Cumæan, Trojan or Hellespontine, Phrygian, and Tiburtine. Of these, by far the most celebrated is the Cumæan, identified by some ancient authors with the Erythræan, and personally known by the names Herophile, Demo, Phemonoë, Deiphobe, Demophile, and Amalthæa. She figures prominently in the 6th book of Virgil's *Æneid,* as the conductor of the poet into the realm of the shades. The Roman legend concerning her (as recorded by Livy) is, that she came from the East, and appearing before King Tarquin the Proud, offered him nine books for sale. The price demanded appeared to the monarch exorbitant, and he refused to purchase them. She then went away, destroyed three, and, returning, asked as much for the remaining six as for the nine. This was again refused, whereupon she destroyed other three, and once more offered to sell him the rest, without abatement of the original price. Tarquin was struck by her pertinacity, and bought the books, which were found to contain advices regarding the religion and policy of the Romans. They were preserved in a subterranean chamber of the temple of Jupiter on the Capitoline, and were originally intrusted to two officials (*duumviri sacrorum*) appointed by the senate, who alone had the right to inspect them. The number of keepers was afterward increased to 10 (*decemviri*), and finally by Sulla to 15 (*quindecemviri*). B.C. 83, the temple of Jupiter having been consumed by fire, the original Sibylline books or leaves were destroyed, whereupon a special embassy was dispatched by the senate to Erythræ, to collect the oracles anew: they brought to Rome about 1,000 verses, which, with others brought from Ilium, Samos, Sicily, Italy, and Africa, were deposited in the temple of Apollo Patrous in the 12th year of the reign of Augustus. It is believed that they were burned by Stilicho about A.D. 400. Besides these 'genuine' oracles, there were spurious collections, as appears from the fact that by order of Augustus a great many such were burned. It is beyond doubt that as early, at least, as the 2d century after Christ, when enthusiastic men sprang up in the Christian Church, prophesying in a poetic-oracular style (whence they were sometimes called *Sibyllists*), the Sibylline books were much interpolated and falsified to assist the progress of the new faith. The utterances of these Christian Sibyllists form a special department of early ecclesiastical literature, and are a mixture of Jewish, Pagan, and Christian ingredients: the collections of them also bear the name Sibylline Verses or Sibylline Books. In the *Dies Iræ* 'the Sibyl' is quoted with David as authority for the belief in a final destruction of the earth by fire—*teste David cum Sibylla.* An ed. of the *Oracula*

Sibyllina was published by Gallæus 1689.—See works on the Sibylline Books by Bleek (1819), Volkmann (1853), Ewald (1858).

SIC, ad. *sĭk* [L. *sic*, so, thus]: a word which, when placed within brackets immediately after a quoted word or expression, indicates a difference of opinion with the author or speaker, and expresses something between a doubt and a sneer, as saying 'can this be correct?'

SIC'ARD, MONTGOMERY: American naval officer: b. Utica, N. Y., 1836, Sept. 30; d. Westernville, N. Y., 1900, Sept. 14. He was appointed acting midshipman in 1851 and rose to be lieutenant in 1860. He was assigned to the Gulf blockading squadron in 1861 and as executive officer on the Oneida was engaged at the bombardment of Forts Jackson and Saint Philip. He assisted in the destruction of the Confederate flotilla in 1862, participated in the passage of the Vicksburg batteries and commanded in the engagement with the Confederate ram Arkansas in that year. He was in command of the Seneca in both attacks on Fort Fisher and was in charge of the left wing in the naval land assault on that fort 1865, Jan. 15. He was engaged in various commands after the Civil War, was inspector of ordnance at the Boston navy yard in 1880-2, chief of the bureau of ordnance in 1882-90, and in 1894-7 he was successively in command of the Portsmouth and Brooklyn navy yards. He was appointed commander-in-chief of the North Atlantic Squadron in 1897 with rank as rear-admiral, but at the outbreak of the Spanish War was placed on sick leave. After partial recovery he asked for active duty and was appointed president of the board of strategy. He was retired in 1898 after 47 years of service.

SICARD, ROCH AMBROISE CUCURRON: educator of the deaf and dumb: b. Fousseret, near Toulouse, 1742, Sep. 20; d. Paris 1822, May 10. He was appointed in 1786 director of a school established for the training of deaf-mutes by the archbishop of Bordeaux. In 1789 he removed to Paris, and was chosen successor to the Abbé l'Epée as director of the Paris Institution for Deaf-mutes. He made some important improvements in the system of his predecessor. During the Revolution he narrowly escaped with his life; and having under the Directory become one of the conductors of the 'Annales Religieuses,' it was only by concealing himself that he avoided the consequences of a sentence of exile pronounced against himself and other journalists. On the overthrow of the Directory he resumed his duties at the school of instruction for the deaf and dumb, and in 1816 he was made member of the Academy. Besides other works, he was the author of *Cours d'Instruction d'un Sourd-muet de Naissance;* and *Théorie des Signes pour l'Instruction des Sourds-muets.*

SICCAR: see SICKER.

SICCATIVE, a. *sĭk'ă-tĭv* [L. *siccātus*, dried up; *siccārē*, to dry—from *siccus*, dry]: drying; causing to dry: N. that which promotes drying.

SICE, n. *sīs* or *sīz* [F. *six*, six—from L. *sex*, six]: the number six at dice.

SICH, a. *sĭch:* OE. for SUCH.

SICILIAN, a. *sĭ-sĭl'ĭ-ăn:* of or relating to Sicily, an island s. of Italy.

SICILIANO, *sĭ-sĭl-ĭ-â'nō*, It. *sē-chē-lē-â'nō*, or SICILIA'NA, *-nâ*, in Music: slow, soothing, pastoral air, in 6–4 or 6–8 time; so called because the dance peculiar to the peasantry of Sicily possesses this character.

SICIL'IAN VES'PERS: name given to the massacre of the French in Sicily, on the day after Easter 1282, Mar. 30, the signal for whose commencement was to be the first stroke of the vesper-bell. Charles of Anjou, brother of Louis IX. of France, had deprived the Hohenstaufen dynasty of Naples and Sicily, and parcelled out these kingdoms into domains for his French followers; but his cruelty toward the adherents of the dispossessed race, his tyranny, oppressive taxation, and the brutality of his followers, excited among the vindictive Sicilians the deadliest animosity (see NAPLES: KONRADIN: MANFRED: ETC.). The aged Giovanni da Procida, a steady partizan of the Hohenstaufen family, took the lead in directing and systematizing a conspiracy against Charles and his followers; and after a visit to Pedro of Aragon (husband of Constance, the cousin of Konradin, and next heir to Naples and Sicily), whom he found willing to undertake the conquest of Sicily, he returned to his self-imposed duty in the island. On the evening of Easter-Monday, the inhabitants of Palermo, enraged (according to the common story) at a gross outrage by a French soldier on a young Sicilian bride, precipitated the accomplishment of the scheme by suddenly rising upon their oppressors, putting to the sword every man, woman, and child of them, not sparing even those Italians and Sicilians who had married Frenchmen. This example was followed, after a brief interval, by Messina and the other towns, and the massacre soon became general over the island: the French were hunted like wild beasts, and dragged even from the churches, where they vainly thought themselves secure. More than 8,000 of them were slain by the Palermitans alone. Only one instance of mercy shown to a Frenchman is on record. The gov. of Messina also succeeded in passing the strait with his garrison before it was too late. The 600th anniversary of the Sicilian Vespers was celebrated with much enthusiasm 1882, Garibaldi (shortly before his death) having come to Palermo to be present. He was, however, too feeble to take part in the ceremonies.—See Amari, *La Guerra del Vespro Siciliano*

SICILY, *sĭs'ĭl-ĭ:* largest, most fertile, and most populous island in the Mediterranean Sea; lat. 36° 38′—38° 18′ n., and long. 12° 25′—15° 40′ e.; separated from the mainland of Italy by the Strait of Messina. Its shape roughly resembles a triangle (whence the early Greek navigators gave it the name of *Trinacria,* 'Three-cornered')—the e. coast, from Capo del Faro in the n. to Capo Passaro in the s., forming the base; and the n. and s.w. coasts the sides, which gradually approach each other toward the n.w. The length of the base is 145 m.; of the n. side, 215 m.; and of the s.w., 190 m.; circumference, including the sinuosities of the coast, estimated 624 m.; area about 10,000 sq. m. Pop. (1901) 3,529,799. Capo Passaro, at the s.e. extremity, is only 56 m. from Malta; and Capo Boco, near Marsala, at the n.w., only 80 m. from Cape Bon on the African coast.

Physical Geography.—The island of S. is traversed throughout its entire length by a chain of mountains, which may be regarded as a continuation of the Apennines (q.v.). This chain, beginning at Capo del Faro on the Strait of Messina, runs s.s.w. as far as Taormina, where it turns off to the w., and stretches across the whole island, keeping, however, much nearer to the n. than the s.w. coast. The first part of the chain, from Capo del Faro to Taormina, is called the Peloric range which in Monte Dinnamare attains the height of 3,260 ft.; the second and much the longer part is called the Madonian range, which in the Pizzo di Palermo rises 6,328 ft. It forms the great water-shed of the island. Toward the n.w. coast, the chain breaks into irregular, often detached masses—e.g., Monte Pellegrino (1,963 ft) and Monte San Giuliano (2,184 ft.). About the centre of the chain, a range branches off through the heart of the island to the s.e.—at first wild and rugged, afterward smoothing down into table-lands, which in turn slope away tamely to the sea. There are innumerable other spurs to the s. from the great Madonian chain, of inferior length and elevation. For the volcano of Etna which rises in solitary grandeur on the e. coast, see ETNA. S. is not, on the whole, a well-wooded country, but some forests of considerable size are found—e.g., the royal forests near Caronia and Mezzojuso, the forest-zone of Etna, etc. In the interior there is not much level land, but on parts of the coast are extensive plains of great fertility. The principal of these are the great plain of Catania, out of which rises Etna; the plains of Palermo, termed the *Conca d'Oro,* or 'Golden Shell,' of Castellamare, of Licata, and Terranova. Although rivers are numerous, none are navigable.

Climate.—The climate of S. is warm, but salubrious, except in low-lying places, where there is a mephitic atmosphere. The best health is enjoyed in the lower region of Etna, which is densely peopled, though exposed to violent earthquakes. The heat

is intense in summer when the sirocco blows. After the autumnal equinox, violent winds are prevalent, torrents of rain fall, and all along the coasts the atmosphere is charged with moisture and fogs. The earthquakes begin about the end of winter, and do great damage. Snow and ice are rarely seen, except on Etna.

Geology and Mineralogy.—The primary rocks in the mountainous districts are chiefly quartz, granite, and mica. In some parts these are overlaid by limestone rocks. Most of the lower ranges of hills are of calcareous formation, and rich in metallic ores. Sulphur forms the chief mineral wealth: immense beds of it are in the central and n. parts of the island. The mines are worked by Cornish miners and their descendants.

Soil, Agriculture, etc.—The soil is so fertile that little labor is required to raise the crops. In many valleys there is rich soil to the depth even of 40 ft. In Catania, decomposed lava is spread over the ground, greatly increasing its fertility. The crops of grain are large, and might be prodigious if agriculture were better understood: the harvests are such that they recall to mind the words of Livy, in speaking of S.: 'Populoque Romano, pace ac bello, fidissimum annonæ subsidium' (lib. xxvii. 5). In the most ancient times, agriculture was sedulously prosecuted, but it began to decline when the island was deprived of its independence by the Carthaginians. In more recent times, the restrictions on the exportation of grain served to retard not only agriculture, but also commerce, which, on every attempt at advance, was met by fresh obstacles in the shape of new taxes. The Italian govt. has greatly alleviated the obstacles to agriculture, and the salutary effects of the change of system are already apparent. The soil produces corn, maize, flax, hemp; excellent cotton near Mazzara and in Catania; sugar, equal to that of the E. Indies, along the s. coast; grapes (350,000 acres), olives (125,000 acres, with annual yield in oil of 15,000 tuns), saffron, oranges, lemons, citrons, pomegranates, figs, pistachios, dates, castor-oil, mulberry, sumach, tobacco, and manna. The vine has been cultivated with the greatest care at Marsala since 1789, when an English firm settled there began to export it. Now more than 5,000,000 gallons are annually exported to England, America, and India.—S. has the best tunny-fisheries in the Mediterranean. The fisheries for coral obtain, on an average, about 2,100 lbs.

Manufactures, Commerce, etc.—The manufactures are insignificant, and nearly confined to silk, cotton, and leather. —The most important articles of export are sulphur, sumach, fruits, and wine; of import, cottons, woolens, silks, linens, earthenware, hardware. Great Britain, France, and the United States are chiefly the countries with which the Sicilians carry on commerce. The statistics of exports and imports are untrustworthy; but the latter considerably exceed the former. More than 200 m. of railways have recently been constructed.

Religion, Education, etc.—Except about 58,000 Greeks and a few thousand Jews, the inhabitants are Rom. Cath.:

but though equally ignorant, they are not so superstitious as the Neapolitans; at least their superstition has not destroyed their love of political freedom, as has repeatedly been evinced in their history—most recently in the ardor with which they responded to the summons of Garibaldi to liberate themselves from the tyranny of the Bourbons. There are three universities—at Palermo, Catania, and Messina; also a Collegio de' Nobilé at Palermo.

Political Divisions.—S. is divided into 7 provinces or prefectures—Palermo, Messina, Catania, Noto or Siracusa, Caltanisetta, Girgenti, and Trapani. Each province is subdivided into 3 or 4 districts, and these again into numerous *communi* or 'townships.' Over the province is placed an *intendente*, or, as he is now called, a 'prefect;' over the district, a sub-prefect; and over the commune, a *sindaco* ('syndic,' or 'mayor'). The prefect presides over every dept. of the provincial administration, also over the provincial council of 15 to 20 land-holders, who meet once a year, and sit 20 days, examining the accounts of the province, and framing the provincial budget. The two subordinate divisions also have their 'councils;' and the members of all three are appointed by either the king or the prefect. Of course this insular self-government does not supersede the necessity of sending Sicilian deputies to the national parliament at Rome.

History.—S. was inhabited, in pre-historic times, by a people who bore the name *Siculi* or *Sicani*, and who—according to a universally received tradition—crossed over into the island from the s. extremity of the mainland. Their names and every fact that we can ascertain about them lead to the supposition that they were members of the great Latino-Italian family that, entering Italy from the n., gradually pushed its way across the Apennines to the peninsula of Bruttium (see ROME). Beyond this rational conjecture, however, we cannot proceed, and the actual history of S. begins to emerge out of utter darkness with the establishment of Greek and Phœnician colonies. The earliest Greek colony, Naxos, was founded B.C. 735; the latest, Agrigentum, B.C. 580. During the intervening century and a half, numerous important colonies were established (either directly from Greece or as offshoots from the older Greek settlements in the island): Syracuse B.C. 734, Leontini and Catana B.C. 730, Megara Hyblæa B.C. 728, Gela B.C. 690, Zancle, later Messana (date uncertain), Acræ B.C. 664, Himera B.C. 648, Mylæ (date uncertain), Casmenæ B.C. 644, Selinus B.C. 628, Camarina B.C. 599. The earlier history of these cities is almost unknown. What is recorded is vague and general. We read that they attained great commercial prosperity; that they subjugated, or wrested from the Siculi, Elymi, and other 'native' tribes, large portions of neighboring territory; and that their governments (like those of the republics in the mother country) were at first oligarchical, and latterly democracies or 'tyrannies;' but not till the period of the 'despots' have we detailed accounts. Then the cities of Agrigentum and Gela acquire prominence—the former,

under the rule of Phalaris (q.v.), becoming, for a short time, probably the most powerful state in Sicily; and the latter, under a succession of able tyrants, Cleander, Hippocrates, and Gelon (q.v.), forcing into subjection most of the other Greek cities. Gelon, however, transferred his government to Syracuse (one of his conquests), which now became the principal Greek city of Sicily—a dignity that it ever after retained. Contemporary with Gelon, and possessed of the same high capacity for governing, were Theron, 'tyrant' of Agrigentum, and Anaxilaus, tyrant of Rhegium, and conqueror of Zancle, to which he gave the name Messana. Meanwhile the Carthaginians —a people wholly different from the Greeks in language, religion, origin, and civilization—had obtained possession of the Phœnician settlements in Sicily. The first appearance of the Carthaginians in the island dates from B.C. 536; but the steady growth of the Greek cities in wealth and power long confined their rivals to the N.W. part, where their principal colonies were Panormus, Motya, and Soloeis. The first open trial of strength took place in the great battle of Himera, where the Carthaginian army was utterly routed by Gelon, and its leader Hamilcar slain. The Gelonian dynasty at Syracuse fell B.C. 466, after various fortunes. During the next 50 years, the island had peace. B.C. 410, however, the war between the Carthaginians and Greeks for possession of the island was renewed. The successes of the former were great and permanent. Selinus, Himera, Agrigentum, Gela, and Camarina fell into their hands in less than five years; and it was not till Syracuse had got a new 'tyrant,' the famous Dionysius (q.v.) the Elder, that fortune again began to favor the Greeks. Even he, however, could not wrest from the Carthaginians what they had won; and after the war of B.C. 383 peace was concluded, leaving Dionysius in possession of the E., and the Carthaginians of the W., half of the island. The dissensions and tumults that followed the death of Dionysius illustrate forcibly the peculiar dangers to which the Greek republics, either at home or abroad, were prone; but we can only note the triumph of the popular party under Timoleon B.C. 343, and the splendid victory of the latter over the Carthaginian generals, Hasdrubal and Hamilcar, at the river Crimisus, B.C. 340. Once more Greek influence was in the ascendant, but the rule of the bold and ambitious tyrant Agathocles, B.C. 317 –289, proved in the main disastrous to Greek supremacy. After his death, Syracuse lost her hold over many of the Greek cities, which established a weak and perilous independence, that only rendered the preponderance of the Carthaginians more certain. Finally Pyrrhus (q.v.), King of Epirus, was invited over to help his countrymen, and B.C. 278 he landed in the island. The brilliant adventurer —one of the most romantic figures in classic history—for a time swept everything before him. Panormus, Ercte, and Eryx were captured; and though he failed to make himself master of Lilybæum, he might probably have forced the Carthaginians to surrender it, had he not been

thwarted in his designs by the miserable discords and jealousies of the people whom he came to save. As it was, Pyrrhus left Sicily in about two years; and the island would probably have sunk into a Carthaginian possession, had not a new power appeared on the stage—the Roman. For the struggle for supremacy between Rome and Carthage, the most tremendous struggle in ancient history, see ROME, and the names of the leading generals. In B.C. 246 Carthaginian S., and B.C. 210 the whole island, became a Roman 'province'—the first Rome ever held. Henceforth it shared the fortunes of the great state to which it was annexed, and its special history need only be rapidly glanced at. In B.C. 135–132, and again B.C. 103–100, it was the scene of two formidable slave-insurrections, during which it was frightfully devastated. Its fertility, and the wealth of its citizens and land-holders, were also powerful temptations to greedy and unscrupulous governors, of whom a specimen is Verres, pretor B.C. 73–70, 'damned to everlasting fame' in the Orations of Cicero. Augustus visited S. after the close of the civil wars, and established some colonies; but it does not seem to have prospered under the empire; and A.D. 440 it was conquered by the Vandals under Genseric. The Vandals, in their turn, were compelled to cede it (480) to Theodoric, King of the Ostrogoths, in whose hands it remained till 535, when Belisarius conquered and annexed it to the Byzantine empire. In this condition it remained till 827, when the Saracens invaded the island, and after a protracted struggle, lasting 114 years, expelled the Byzantine Greeks, and made themselves masters of Sicily. They kept possession of it more than a century, but after a contest of 30 years were driven out by Robert Guiscard (q.v.) and Roger de Hauteville, at the head of a body of Normans, aided by the 'native' inhabitants, whom we conjecture to have been much the same as in the old classic times—for the successive waves of barbaric and Saracenic invasion that swept over the island appear to have left little trace of their action. Even to this day, it is highly probable that the people of S. are largely the descendants of the early Siculi. The Normans held rule in the island 1072–1194; and the Norman 'Kingdom of Sicily and Naples' or 'Kingdom of the Two Sicilies,' dates from 1130, when Roger II., obtaining possession of most of the continental dominions of his uncle, Robert Guiscard, assumed the title of king. During the rule of the Swabian dynasty (see HOHENSTAUFEN, HOUSE OF), 1194–1258, the political history of S. is the same as that of Naples; but 1282, after the dreadful massacre of the French, known as the Sicilian Vespers (q.v.), it again became independent, chose for its king Pedro III. of Aragon, who was the sole representative by marriage of the House of Hohenstaufen, and remained in the possession of the Aragonese sovereigns till 1505, when the union of the crowns of Castile and Aragon —in other words, the rise of the Spanish monarchy in the persons of Ferdinand and Isabella—placed it under the dominion of Spain. The fortune of war also gave Ferdinand the possession of Naples; and the Spanish kings retained

both countries until the war of the Spanish succession, 1700-13. By the treaty of Utrecht (1713), Sicily was separated from Naples; and transferred to Victor Amadeus, Duke of Savoy, who, however, restored it to the crown of Naples by the treaty of Paris, seven years later, receiving in exchange the island of Sardinia. From 1720 the two countries continued under the same dynasty, the House of Austria, 1720-34; and the Spanish Bourbons 1734-1860 (if we except the brief rule of the French in Naples, 1806-15, when Joseph Bonaparte, and afterward Joachim Murat, were kings), till the period of Garibaldi's invasion (see ITALY: GARIBALDI), which resulted in the annexation of both to the new kingdom of Italy under Victor Emmanuel.

Sicily has been the scene of disastrous earthquakes from time immemorial, but none of the many recorded disturbances were of sufficient severity to be placed among the great disasters, until the earthquake of Dec. 28, 1908, which is the most direful catastrophe of modern times. While Messina, and Reggio, in Calabria were the largest towns in the stricken region and were entirely destroyed, the whole of Sicily was shaken, a wide area desolated, the whole civilized world being called upon to save the survivors from starvation, until another year's crops could be raised. In advance of official reports, reliable estimates place the loss of life at upwards of 200,000, and of property about $1,000,000,000, the major part being in Sicily.

SICK, a. *sĭk* [AS. *seóc;* Ger. *siech;* Icel. *siukr;* Goth. *siuks,* sick: probably connected with SIGH, which see; comp. Low Ger. *sucht,* a sigh, sickness: Dut. *suchten,* to sigh, languish: Gael. *sgith,* weary]: affected with disease of any kind; indisposed; not in health; inclined to vomit; weary of: V. in *OE.,* to sicken. SICK'ISH, a. *-ĭsh,* inclined to be sick; exciting disgust. SICK'ISHLY, ad. *-lĭ.* SICK'ISHNESS, n. *-nĕs,* the quality of being sickish. SICK'LY, a. *-lĭ,* not healthy; ailing; feeble. SICK'LINESS, n. *-lĭ-nĕs,* state of being habitually diseased or in bad health. SICK'NESS, n. *-nĕs,* state of being in bad health; illness. SICK-BAY, n. a portion of the main-deck of a vessel, usually in the bow, partitioned off for invalids. SICK-BED, the bed to which one ailing is confined. SICK-BERTH, in a *ship of war,* an apartment for the sick. SICK HEADACHE, headache attended with disorder of the stomach and nausea. SICK-LIST, names of persons ailing. SICK-ROOM, the apartment where one lies ill. THE SICK, those affected with disease. SICKEN, v. *sĭk'n,* to make sick or squeamish; to fall into disease; to languish; to decay. SICK'ENING, imp. *-nĭng:* ADJ. disgusting; making sick. SICK'ENED, pp. *-nd.* —SYN. of 'sick, a.': ill; disordered; diseased; morbid; ailing; feeble; distempered; indisposed; weak; disgusted.

SICKER, or SIKER, a. *sĭk'ĕr* [Dan. *sikker;* Ger. *sicher,* sure, safe—from L. *secūrus,* safe]: in *Scot.* and *OE.,* certain; sure; firm; having assurance of mind: V. to

make certain; to secure; also spelled SICCAR. SICK'ERNESS, n. in *OE.*, security.

SICKINGEN, FRANZ VON: German soldier and Protestant reformer; b. near Kreuznach 1481, Mar. 2; d. 1523, May 7. From early youth he devoted himself to the military life. The protection of the oppressed was his chief occupation. He assisted many a creditor in procuring what was due him from a powerful debtor. He was the enemy of tyranny, and endeavored on every occasion to repress the despotism of princes and the arrogance of the priests. Without being a scholar he loved science and protected men of learning (for instance Reuchlin, whom he defended against the monks of Cologne); and in his castle of Ebernburg many persecuted scholars found a safe asylum. He was a friend of the Reformation, and contributed greatly to extend it in the countries which bordered on the Rhine. At last he engaged in a quarrel with Treves, the palatinate, and Hesse, which drew upon him the ban of the empire. He died soon after the surrender of Neustall, one of his castles, having previously received a severe injury from a fall during a sally.

SICKLE, n. *sĭk'kl* [AS. *sicol*, Ger. *sichel*, a scythe for mowing hay—from L. *secŭla*, a sickle—from *secārĕ*, to cut]: an instrument for cutting down grass or grain; a reaping-hook. SICKLED, a. *sĭk'kld*, furnished with a sickle.

SICKLES, *sĭk'lz*, DANIEL EDGAR: soldier: b. New York, 1823, Oct. 20. He studied at the University of New York, learned the trade of printer, then studied law and commenced practice 1844 in New York. He was elected to the state legislature as a democrat 1847, went to London as secretary of legation 1853, became state senator 1855, and entered congress 1857, Dec. For criminal intimacy with Mrs. Sickles he killed Philip Barton Key 1859, Feb. 27, and was acquitted of murder after a trial which continued 20 days. He served in congress till 1861, when he raised the Excelsior brigade of Union troops. He was appointed colonel and was afterward promoted brigadier-general and major-general, served at Fair Oaks, Malvern Hill, Antietam, Fredericksburg, and Chancellorsville, and lost a leg at Gettysburg; was in command of the district of the Carolinas 1865-67; was minister to Spain 1869-73, and since the latter date has resided in New York. He has been connected with various state boards; was appointed commissioner of emigration 1887, May; and sheriff of the city and county of New York, to fill the unexpired term of James A. Flack, 1890, Mar. 28. In military service he was brevetted brigadier-general and major-general, and was retired 1869, Apr. 14, with rank of major-general U. S. army. In 1902 he became commander in Medal of Honor Legion.

SICK MAN OF EUROPE, THE: a term applied to Turkey in 1854, by the Czar Nicholas, in a conversation

with Sir Hamilton Seymour, the British ambassador at St. Petersburg. The czar intimated his opinion that Turkey was sick and dying. He therefore proposed that, to avoid a European war when the demise took place, Russia and Great Britain should come at once to a private arrangement as to the disposal of the Sick Man's effects. As France was ignored in the arrangement, there was some doubt as to the good faith of the czar. The British government rejected the proposal, intimated its belief in the recovery of the Sick Man, and soon after fought by his side in the Crimean war.

SICYON, *sĭs'ĭ-on:* principal city of a very small but exceedingly fertile state of ancient Greece, Sicyonia, in the n. of the Peloponnesus, having the Corinthian Gulf for its n. boundary, with Achaia on the w., Phlius on the s., and Corinth on the e. The territory was level toward the sea, somewhat mountainous in the interior, and well watered by the two rivers Asopus and Helisson, between which, on a triangular plateau, was situated Sicyon, about 2 m. s. of the Corinthian Gulf, 10 m. n.w. of Corinth. Round the three sides of the plateau ran a wall, which, combined with the precipitous nature of the heights that surrounded it, rendered the position of Sicyon one of great strength. It is supposed that at one time it had, like Athens, a double wall reaching from the city to the port on the Sea of Corinth. Sicyon was anciently celebrated as a chief seat of painting and statuary (tradition asserting that the former was invented there), it having given its name to a school of painting which included among its disciples Pamphilus and Apelles, both natives of Sicyon. It was the native city also of Aratus, general of the Achæan League. There exist at the present day a few remains of the ancient city, as well as of the more modern buildings erected by the Roman conquerors of Greece, near which stands a small modern village named *Vasilika.*

SIDA, *sī'dâ:* genus of plants of nat. order *Malvaceæ,* containing a large number of species, annual and perennial herbaceous plants and shrubs, natives mostly of warm climates, and widely diffused. They generally abound in mucilage, and some are used in medicine in India, as the Mallow and Marsh-mallow are in Europe. They have also strong pliable fibers, used for cordage and for textile purposes.—*S. tiliæfolia,* an annual, has long been cultivated in China, where it is called *King-Ma,* for its fiber, used like that of hemp. Its cultivation has been introduced into Italy and France.—In North America several species of Sida are small-flowered weeds, from New York southward. *S. Napæa,* with axillary corymbs of white flowers, the corolla 1 inch broad, wild in Pennsylvania and Virginia, was cultivated in gardens.

SIDDHARTHA ('he who has accomplished his aim'): the name given to Prince Gautama Buddha at his birth

in the 7th c. B.C. This was his individual name; Gautama, that of his tribe—settlers in Gakja or Gauta, a region situated between the plain of the Ganges and the Himalaya Mountains. Buddha was a title of later origin.

SIDDONS, *sĭd'onz*, SARAH (KEMBLE): English actress: 1755, July 5—1831, June 8; b. Brecon, S. Wales; eldest of 12 children of Roger Kemble, a provincial actor. As a mere child, she was brought on the stage on the occasion of a benefit of her father's; and from that time up to her 15th year she continued to act as a regular member of his company. She was married to Wm. Siddons, an actor, at Trinity Church, Coventry, 1773, Nov. 26, and with her husband went to act at the Cheltenham theatre. Here in the year following she drew great attention; and Garrick, hearing her praises in London, sent a trusty emissary to report upon her. The result was an engagement at a salary of £5 a week, at the London Drury Lane Theatre, where 1775, Dec. 29, she made her first appearance, acting Portia in *The Merchant of Venice* to the Shylock of Garrick. Her beauty and dignity of person pleased the audience; but as an actress she made no great impression, and at the close of the season she failed to secure a re-engagement.

Leaving London in disappointment, 1776, Mrs. Siddons went to play in the provinces—at Birmingham, Manchester, and York; and found a very successful engagement at Bath (1778-82); at the end of which she was recalled to Drury Lane, and in London entered on a career of triumph as indisputably the greatest actress of her time. The growth of her provincial reputation had determined her recall to the metropolis, where her appearance in Southern's *Isabella* was an epoch equalled only by Garrick's in 1741 and Edmund Kean's in 1814. Until she took her leave of the public 1812, June 29, in her great character of Lady Macbeth, her course was one long series of successes. Subsequently she occasionally consented to reappear on the stage for charitable ends, or to promote a stage 'benefit.'

As a tragic actress, Mrs. Siddons has probably never in Britain been equalled. For comedy she had no gift. Her earlier acting was strongest in tenderness and pathos; in later years she developed an unequalled grandeur in depicting the terrible passions. As Lady Macbeth, she invested the character with tragic awe: this part and that of Queen Catherine in *Henry VIII.* exactly fitted her extraordinary powers. As a woman, she was of unblemished reputation and was held in respect by all who knew her. She had the friendship of many persons of eminence. Her genius is said to have been strictly a *stage* genius; elsewhere she seems to have displayed no extraordinary gifts. But her manner could make even mediocrities imposing. She carried her tragedy mode with her to the drawing-room or the dinner-table; Scott has re-

corded the amusement with which at Abbotsford he heard her stately blank verse to the domestic:

'I asked for water, boy! you've brought me beer;'

and Sydney Smith used to say it was never without a certain awe that he saw her '*stab the potatoes.*'

SIDE, n. *sīd* [Icel. *sida;* Dan. *side;* Dut. *zijde;* Ger. *seite,* a side]: the long or broad part of anything as distinguished from the end; the part of an animal from the shoulder to the buttock, as a *side* of bacon; one part of a thing as seen by the eye; any part generally; the margin; edge; border; quarter; region; party; sect; branch of a family; any part or position viewed as opposite to, or as contrasted with, another; used to denote consanguinity, as, by the mother's *side:* ADJ. toward the side; lateral; oblique; indirect: V. to embrace the opinions of one party in opposition to another; in *OE.,* to be at the side of. SI'DING, imp.: N. the attaching one's self to a party; in *railways,* a short line of rails turning off from the main line. SI'DED, pp.: ADJ. having a side, as one-*sided.* SI'DER, n. *-dėr,* one on a particular side, as out-*sider.* SIDE'LING, ad. *-lĭng,* with the side foremost; sloping. SIDE-ARMS, weapons worn at or by the side, as a sword or bayonet. SIDEBOARD, a piece of furniture placed at the side of a room. SIDE-CUT, an indirect blow or attack. SIDE-DISH, a dish at the side of a table, as opposed to the top and the bottom. SIDE-GLANCE, a glance or brief look to one side. SIDELONG, a. oblique; not directly in front: AD. obliquely; in the direction of the side. SIDE-PLATES, the parts at the back of a plow which prevent the earth falling into the body of the plow. SIDE-POCKET, a pocket at the side. SIDE-POSTS, among *carpenters,* a kind of truss-posts, placed in pairs, for supporting the principal rafters, braces, etc. SIDE-SADDLE, a saddle for a lady. SIDESMAN, n. *sīdz'măn,* an officer in a church; an assistant to the churchwarden. SIDE-TABLE, a table placed against a wall, or apart from the chief table. SIDE-TAKING, engagement with a sect or party. SIDE-VIEW, a view on or from one side. SIDE-WALK, the raised footway of a street. SIDE'WAYS, ad. *-wāz,* toward the side; on one side. SIDE-WIND, a wind blowing against the side; indirect means. SIDE'WISE, ad. *-wīz,* toward one side; inclining. BY THE SIDE OF, close at hand; near to. TO CHOOSE SIDES, to select for competition in exercises of any kind. TO TAKE SIDES, to embrace the opinions of a party in opposition to those of another, or to attach one's self to their interests. SIDE BY SIDE, close together and abreast.—SYN. of 'side, n.': margin; edge; verge; party; interest; cause; favor; faction; sect; border; slope; declivity.

SIDE'-BONES: enlargements above a horse's heels, resulting from the conversion into bone of the elastic lateral cartilages. They occur mostly in heavy draught-horses with upright pasterns, causing much stiffness, but

—unless of rapid growth—little lameness. They are treated at first by cold applied continually, until heat and tenderness are removed, when blistering or firing is resorted to.

SIDERATION, n. *sĭd-ėr-ā'shŭn* [L. *sidus,* a star; *sīdĕris,* of a star]: in *med.,* a name given to erysipelas of the face or scalp, from the idea of its being produced under the influence of the planets.

SIDEREAL, a. *sī-dē'rĕ-ăl* [L. *sīdĕrālis,* of or belonging to the stars—from *sidus,* a star]: relating to or containing stars; starry; measured by the apparent motions of the stars. SIDERAL, a. *sī'dėr-ăl,* in *OE.,* starry; astral. SIDEREAL CLOCK, clock regulated to indicate sidereal time —indispensable in an observatory. SIDEREAL DAY, period in which the earth performs one complete revolution round its axis (see DAY). SIDEREAL YEAR, time which the sun, in its apparent motion, takes to move from any fixed star till it returns to it again, being the real time in which the earth performs one complete revolution, computed at 365 days 6 hours 9 minutes 9.6 seconds. See YEAR.

SIDERITE, n. *sĭd'ėr-īt* [Gr. *sidērŏs,* iron or steel]: a mineral composed of carbonate of iron, and when pure crystallizing in the rhombohedral system. It then is also known as spathic iron. Another name is chalybite. The faces of the rhombohedral crystals are commonly curved, and there is a perfect rhombohedral cleavage. Besides this it occurs in botrycidal and in globular form, with a more or less fibrous internal structure. Again it is massive, or coarsely or finely granular. The hardness is 3.5 to 4.5; the specific gravity 3.7 to 3.9. It has a vitreous lustre, and is often more or less pearly. The color varies from ashgray, through yellowish-gray, greenish-gray, to brown and brownish-red; sometimes it is white. The streak is white. It is commonly translucent or subtranslucent. In composition it is: $FeCO_3$; carbondioxide 37.9 and iron protoxide, 62.1. Part of the iron is usually replaced by manganese, and often by magnesium or calcium.

The principal varieties are (*a*) crystallized, (*b*) concretionary, in globular form, with fibrous structure, (*c*) granular, (*d*) massive, (*e*) oölitic, and (*f*) earthy, with a large admixture of clay.

SIDERO-, prefix [Gr. *sidērŏs,* iron]: of, belonging to, or resembling iron in luster, hardness, or weight, etc.

SIDEROGRAPHY, n. *sĭd'ėr-ŏg'rā-fĭ* [Gr. *sidērŏs,* iron; *graphō,* I write]: art of engraving on steel; in particular, a process of engraving and transfer, in which a design is first engraved on a steel block, which is afterward hardened, and the engraving transferred to a steel roller under heavy pressure; the roller is then hardened and used as a die to impress the engraving on the printing-plate. The inventor of Siderography was Jacob Perkins. The name is

applied also to Dyer's process for printing from steel plates in more than one color. The colored parts of the design are cut out of the main plates, and movable pieces are exactly fitted in, so that they can be retracted or pushed forward at will. They are withdrawn while the main plate is receiving its ink, and they are pushed forward beyond while receiving their supply of ink. This being done, they are brought to one plane, and form a complete plate for printing from.

SIDEROLITES, n. plu. *sĭd'ĕr-ō-līts* [Gr. *sidēros*, iron; *lithos*, a stone]: meteoric stones, chiefly consisting of iron.

SIDEROMANCY, n. *sĭd'ĕr-ō-măn'sĭ* [Gr. *sidēros*, iron; *manteïa*, divination]: divination by burning straw, etc., upon red-hot iron.

SIDEROSCOPE, n. *sĭd'ĕr-ō-skōp* [Gr. *sidēros*, iron; *skopĕō*, I view or explore]: an instr. for detecting small quantities of iron in substances.

SIDEROXYLON, *sĭd-ĕ-rŏks'ĭ-lŏn:* genus of trees of nat. order *Sapotaceæ*, having evergreen leaves and axillary clusters of flowers; natives of warm climates, and very widely distributed. They are remarkable for the hardness of their wood, which is sometimes called Iron-wood, and is at least in some species so heavy as to sink in water. The wood of *S. inerme*, called *Melkhout* at the Cape of Good Hope, is there much used for making boats, bridges, agricultural implements, etc.

SIDI-BEL-ABBÈS, *sē'dē-bĕl-âb-bās':* town of Algeria, province of Oran, 50 m. s. of the town of Oran. It is fortified, and contains barracks, telegraph and post offices. Markets are held here every week. The soil in the vicinity is fertile; grain, tobacco, and fruit are the chief products. Pop. of commune, 6,458.

SID'LAW HILLS: see FORFARSHIRE: BIRNAM.

SIDLE, v. *sī'dl* [from SIDE]: to go or move side-foremost. SI'DLING, imp. *-dlĭng*. SI'DLED, pp. *-dld*. TO SIDLE UP TO ONE, to creep up to one cautiously and little by little.

SIDMOUTH, *sĭd'mŭth:* market-town and watering-place on the s. coast of Devonshire, at the mouth of the little river Sid. S. was a borough and market-town governed by a portreeve, as early as the 13th c. It was anciently important as a fishing town and seaport; but the fishery has declined, and the harbor is mostly filled up with sand and shingle, so that it is accessible to small boats only. The town has for many years been a watering place, favorite for mildness and salubrity of climate. The hills on each side of the valley of the Sid rise to a considerable height, and, where they terminate on the sea-coast, form bold and lofty cliffs, e. and w. of the town, known respectively as Salcombe Hill and High Peak, about 500 ft. above the sea. The esplanade protected by a sea-wall, 1,700 ft. in length, forms an excellent promenade. Some Roman remains have been found here. S. gives the title of viscount to the Addington family.—Pop. (1881) 3,501; (1891) 3,758.

SIDNEY: city and county-seat of Shelby co., O., on Miami river, and at crossing of Dayton and Michigan, and Cleveland Columbus Cincinnati and Indianapolis r. rs. Water-power from the river runs flouring-mills, machine shops, manufactories of carriages, ploughs, reapers, etc. S. has court house, opera house, churches, schools, newspapers, etc.—Pop. (1900) 5,688; (1910) 6,607.

SIDNEY, *sĭd'nĭ*, Sir PHILIP: conspicuous soldier, statesman, and poet at the court of Queen Elizabeth: 1554, Nov. 29—1586, Oct. 7; b. Penshurst, Kent; son of Sir Henry S. and Mary, sister to Robert Dudley the favorite of Queen Elizabeth. When ten years old he was sent to school at Shrewsbury, whence, 1569, he went to Christ-Church, Oxford. From Oxford, he passed to Cambridge, which he left with a high reputation for scholarship and general ability. In 1572, as the custom then was for young men of rank, he went abroad on his travels. He was in Paris when the Massacre of St. Bartholomew took place, and narrowly escaped being one of its victims. Thereafter, he visited Belgium, Germany, Hungary and Italy; and 1575 he returned home, perfected in all manly accomplishments. His uncle, Dudley, Earl of Leicester, was at this time in the zenith of his fortunes, and for S. a court-career lay temptingly open. As a courtier, his success was great; and with Queen Elizabeth he became, and continued through his short life, a special favorite. In 1576, as a mark of her approval, he was sent on an embassy to the court of Vienna, from which he returned in the year following. Shortly afterward he had the boldness to address to the queen a 'Remonstrance' against her proposed marriage with Henry, Duke of Anjou, a union to which she seemed not indisposed. It is significant of the high favor in which he was held by her, that Elizabeth, imperious as she was in temper, and little inclined to brook such interference, seems to have in this instance resented it but for a brief period. About this time, a quarrel with the Earl of Oxford led to S.'s temporary retirement from court, during which, at Wilton, the seat of his brother-in-law, the Earl of Pembroke, he wrote his celebrated *Arcadia*. In 1583 he consoled himself for the marriage of Lady Penelope Devereux, to whom he had been ardently attached, and who figures as the Stella of his poems, by himself marrying Frances, daughter of Sir Francis Walsingham. By this lady, he had one daughter, who survived him. In the spring of 1585, he is said to have meditated sailing with Sir Francis Drake in an expedition against the Spaniards in the W. Indies, but to have been expressly forbidden by Elizabeth, on a ground of anxiety 'lest she should lose the jewel of her dominions.' It does not seem consistent with this pretty story, that later in the same year she appointed him gov. of Flushing, whither he went to take part in the war between her allies, the Hollanders, and the Spanish. As it proved, she thus sent him to his death. At the battle of Zutphen (1586, Sep. 22), in Gelderland, after behaving with conspicuous gallantry, and having a horse killed under him, he received a musket shot in the thigh, from which he had removed his armor; and after

lingering for some days in great suffering, he died at Arnheim in his 33d year. A chivalrous impulse occasioned his death; he had cast off his greaves that he might put his life in 'the same peril with the lord-marshal, who by some mischance was on the field without greaves.' His characteristic passing of the cup of water to a dying soldier when he himself was lying in agony and thirst on the field, may well have occurred as related, though it is scarcely to be regarded as historical. The estimation in which S. was held by his countrymen was shown in the passion of grief with which the news of his death was received. His body was brought to England, and after lying in state, was buried with great solemnity in the old cathedral of St. Paul's, a general mourning being observed throughout the country. The universities issued three volumes of elegies on his death; and Spenser in his *Astrophel,* mourned for the loss of one who as a friend had been dear to him.

The love and admiration which S. won from his contemporaries was mainly a tribute to the singular beauty of his character. His short life was illustrated by no brilliant achievement; and his literary genius, though true and exquisite in its kind, would scarcely of itself have sufficed to account for the fervor of regard he inspired. But his purity, firmness, and grace, and the winning courtesies in which his radiant nature expressed itself, took captive all hearts while he lived, and have since kept sweet his memory. 'Sublimely mild, a spirit without spot,' he lives in the history of his country, as a rare and finished type of English character, in which the antique honor of chivalry is seen shading into the graces of the modern gentleman. His *Arcadia* (pub. 1590) though overrun with the fantastic affectations of the time, is flushed with the lights of a fine imagination, and shows indisputable genius, and reflects its author's sincerity and sweetness. His series of 110 sonnets, *Astrophel and Stella,* was the first body of English sonnets worthy of note. His other chief work was the *Apology for Poesie,* pub. 1595. See Fulke Greville's Biography of S.; Zouch's Memoirs of S. (1808); and H. R. Fox Bourne's *Memoirs of Sir Philip Sidney* (1862); and his best sonnets, selected, in Mrs. Ward's *English Sonnets.*

SID'NEY (or SYD'NEY) ALGERNON: soldier, diplomatist, author, and agitator: 1622–1683, Dec. 7; b. Penshurst, Kent, England; grand-nephew of the famous Sir Philip S., and second son of the second Earl of Leicester, and grandson of the Earl of Northumberland. He received a careful education, and accompanied his father to Denmark and France, whither the earl had been sent on embassies. In 1641 he served with distinction against the rebels in Ireland, of which country his father was then lord-lieut. In 1643, with his elder brother, Viscount Lisle, he crossed to England, ostensibly to take service under the king, then at war with his parliament; but at Liverpool they were detained by the parliamentary commissioners; and from this time S. was an earnest adherent of the parliamentary cause. At the battle of Long Marston Moor, in which he was wounded, S.'s courage and capacity were

conspicuous. In 1646 he was lieut.gen. of the horse in Ireland, and gov. of Dublin; and 1647 received the thanks of the house of commons for his services, and was appointed gov. of Dover. The year before he had been returned to parliament as member for Cardiff. In 1648 he was one of the judges at the king's trial; and though, for some reason not explained, he neither was present at the passing of sentence, nor signed the warrant of execution, his general approval of the proceedings is not doubted. He is reported to have afterward spoken of the execution as 'the justest and bravest action that ever was done in England or anywhere else.' In principle a severe republican (he was of austere disposition), he resented what he deemed the usurpation of power by Cromwell (q.v.), and during the protectorate lived in retirement at the family seat of Penshurst. In 1659, on the meeting of the restored parliament, S. was again in his place. He was nominated one of the council of state, and was sent to Denmark on a political mission. After the Restoration he lived precariously on the continent, flitting about from place to place; but 1677 a pardon was procured him from Charles II., and he returned to his native country. Nevertheless, he was still obdurately republican in his opinions, and it is undoubted that he schemed for the overthrow of the monarchy, and the establishment of a republic in its stead; for this end he solicited the aid of the French monarch, though the charge that he was supplied with money by Barillon, French ambassador, rests on insufficient evidence. Obscurely his designs were suspected, and 1683, June, when the Rye House Plot was announced, the opportunity was seized for riddance of a man felt to be dangerous. With his friend Lord Russell and others, he was arrested, and committed to the Tower; Nov. 21 he was tried for high treason before the brutal Jeffreys, and without show of justice, and in defiance of law, and on the merest mockery of evidence, was found guilty and condemned to die. He was beheaded on Tower Hill. He met his death with heroic firmness, amid general sympathy and indignation. He has ever since had reputation as a patriot hero and martyr; and it cannot be held undeserved—narrow and impracticable as his views manifestly were. In the history and theory of government, S. was more deeply learned than any man of his time. His *Discourses concerning Government* were published 1698; another edition was issued 1704; a third 1751; a fourth 1772. S.'s life has been written by S. W. Meadley (Lond. 1813). See also Blencower's *Sidney Papers* (Lond. 1813).

SID'NEY SUS'SEX COLLEGE: one of the colleges of Cambridge Univ., England; founded 1598 by Lady Frances Sidney, Countess of Essex, or rather by her executors, in obedience to her will. They obtained of Queen Elizabeth a mortmain for the purpose, and purchased of Trinity College the site of the ancient convent of Franciscans, or Gray Friars. There are 10 fellowships.

SIDON, *sī'don* [Heb. Zidon, perhaps 'fishing-place']: anciently, a city of Phœnicia, on the e. coast of the Mediterranean, lat. 33° 34′ 5″ n., 45 m. s. of Berytus, about 125 m. n. of Jerusalem. It was on a rising mound, protected by the sea on the n. and w.; while the bed of a river formed a natural fosse to the s., and the high hills shielded it on the e.; a double harbor gave shelter to its ships. It soon rose, both by its exceptional position and by the daring and enterprise of its inhabitants, to the highest rank among the cities of Phœnicia (q.v.), so that the whole country is sometimes designated by the name of S., 'the Great,' 'the Metropolis.' The extensive commerce of S. is well known from ancient authorities. Its colonies extended over the coast of Asia Minor and the adjacent islands, the coast of Thrace and Eubœa, and even parts of Sicily, Sardinia, Spain, the coast of Cornwall in England, and the Baltic shores, northern parts of Africa, and, in fact, nearly the whole of the ancient world. Its manufactures of glass and linen, purple dye and perfumes, were sources of unbounded wealth; and whether they were the skilful workers, or merely the exporters and traders of those works in gold and silver, ivory and bronze, which were the marvel of both Greeks and Hebrews, it seems certain, that they were considered unanimously the most skilful workmen of their time. Although S. was one of the cities assigned to the Israelites by Joshua, it never in reality belonged to them; but was occasionally in arms against them, either singly, or in league with some of their deadliest enemies, and even subjugated them for a time. After being conquered itself by Tyre, its daughter-city, it attempted to throw off the yoke at the invasion of Phœnicia by Shalmanezer, to which king it surrendered. Under Assyrian, Chaldean, and Persian domination, it retained a kind of independence for its internal affairs, and under the Persians, actually reached its highest prosperity. But an unsuccessful revolt under Ochus against the Persian power, ended in its temporary ruin B.C. 351. Speedily rebuilt and repeopled, it opened its gates to Alexander the Great B.C. 333, and from that time forth it fell successively into the hands of Syrian, Greek, and Roman rulers. Through the middle ages, little is heard of it, except that it was taken by the Crusaders. During part of the 17th and 18th c. it again became a place of commerce; but misrule and violence put an end to its rising prosperity, and the number of its inhabitants has sunk to about 5,000. There is still some little export of silk, cotton, and nut-galls. It is now called Saida, occupies a place somewhat w. of the ancient city, and belongs to the Turkish pashalic of Acre. See PHŒNICIA.

SIDONIAN, a. *sī-dō'nĭ-an:* of or belonging to Sidon (q.v.).

SIEBENBÜRGEN, *sē'bĕn-bürĕh-ĕn* (Seven Castles): German name of the Austrian principality of Transylvania (q.v.).

SIEBENGEBIRGE, *sē'bĕn-gĕh-bĭrch'ĕh:* group of conical heights in Rhenish Prussia, on the right bank of the Rhine, about 22 m. above Cologne. The highest of the peaks is the Löwenkopf or Löwenberg, 1,560 ft.; but the most famous is the Drachenfels (q.v.).

SIEGE, n. *sēj* [F. *siége;* It. *sedia*, a seat or sitting—from *sedĕrĕ*, to sit: comp. the use of L. *obsid'ium*, a sitting down before a town in a hostile way, a siege—from the same root]: act or operation of taking position around or before a fortress or fortified town, to capture it, or to compel its surrender (see below): any continued endeavor to gain possession; the base or bottom of a glass furnace on which the pots containing the fused glass stand; in *OE.*, a seat or throne; a class; a rank; a place: V. in *OE.*, for BESIEGE. SIEGE-ARTILLERY, heavy ordnance used for battering purposes, and of too weighty a character to take the field. A siege-train of guns and their ponderous ammunition is usually maintained in the rear of an army, ready to be brought up for use when required. SIEGE-TRAIN, the cannon, mortars, etc., for carrying on a siege. TO RAISE A SIEGE, to abandon the attempt to take a fortified place by force.

SIEGE: investment by an army of a hostile town or fortress with the intention of capturing it. See FORTIFICATION. With certain elements the success of a S. is beyond doubt; the result being merely a question of time. These elements are: first, the force of the besiegers must be sufficient to overcome the besieged in actual combat, man to man. If this be not the case, the besieged, by a sortie, might destroy the opposing works, and drive away the besiegers. Secondly, the place must be thoroughly invested; so that no provisions, reinforcements, or other aliment of war can enter. Thirdly, the besiegers must in large degree be undisturbed from without: for this it is essential that there shall not be a hostile army in the neighborhood; or if there be, that the operations of the besiegers be protected by a covering army able to cope with the enemy's force in the field. The ancients executed gigantic works to produce these effects. To complete the investment they built a high and strong wall around the whole fortress; and to render themselves secure from without they built a similar wall facing outward, beyond their own position: the first was circumvallation, the second contravallation. It was thus that Cæsar fortified himself while besieging Alexia, and maintained 60,000 men within his ring.. In modern warfare it is considered preferable to establish strong posts here and there round the place, and merely sentries and vedettes between.

Let us now assume that a fortress of great strength has to be reduced, and that the force of the enemy in the vicinity has been either subdued or held in check by a covering army. By rapid movements, the place is at once invested on all sides. This step constitutes merely a blockade; and if time be of little importance, is a sufficient operation, for hunger must sooner or later cause the fortress to surrender; but if more energetic measures are required, the active siege must be prosecuted. Advantage is taken of

any hidden ground to establish the park of artillery and the engineers' park; otherwise these parks have to be placed out of range. The besieging force is now encamped just beyond the reach of the guns of the fortress, and their object is to pass the intervening ground and enter the works without being torn to pieces by the concentrated fire of the numerous pieces which the defenders can bring to bear on every part. With this view, the place is approached by a series of zigzag trenches so pointed that they cannot be enfiladed by any guns in the fortress. In order to accommodate the forces necessary to protect the workers, the trenches at certain intervals are cut laterally for a great length, partly encircling the place, and affording safe room for a large force with ample battering materiel. These are called *parallels*, and are generally three in number. The distance of the first parallel will increase as small-arms become more deadly; but with the old smooth-bore muskets it was usual to break ground at 600 yards from the covered way of the fortress, while at Sebastopol, ground was broken at 2,000 yards, and in the siege of Paris by the Germans, the lines were begun at least 4 miles from the city. The locality of the parallel being decided on, a strong body of men is sent to the spot soon after nightfall. The attention of the garrison is distracted by false alarms in other directions. Half the men are armed cap-à-pie, and lie down before the proposed parallel; while the other half, each bearing pick and shovel, and two empty gabions, prepare for work. Each man deposits the gabions where the parapet of the trench should be. He then digs down behind them, filling the gabions with the earth dug out; and, after they are filled, throwing it over them, to widen and heighten the parapet. Before daylight, the working-party is expected to have formed sufficient cover to conceal themselves and the troops protecting them. During the day, they—being concealed from the garrison—widen and complete their parallel, making it of dimensions sufficient to allow of wagons and bodies of troops with guns passing along. During the same night, other parties will have been at work at zigzags of approach from the depots out of range to the first parallel, which zigzags will be probably not less than 1,000 yards in length. The profile of a completed trench is shown in fig. 1, the shaded portion

Fig. 1.—Profile of a Trench.

representing a gabion. As a rule, the defenders will not expend ammunition on the first parallel, for its extent (often several miles) will render the probability of doing material damage extremely small. For this reason also, the dimensions of the parapet and its solidity are of far less importance in the first parallel than in the more advanced works of attack. The first parallel, AAA, fig. 2, being completed, the engineers select points near its extremities,

at which they erect breastworks, B, B, to cover bodies of cavalry, who are kept at hand to resist sorties from the garrison. The length of the parallel is usually made sufficient to embrace all the works of two bastions at least. Sites are then chosen for batteries, C, C, which are built up of fascines, gabions, sandbags, and earth. They are placed at points in the parallel formed by prolongation of the several faces of the bastions, ravelins, and other works of the fortress, which faces the batteries are severally intended to enfilade by a ricochet fire. Other batteries will be formed for a vertical fire of mortars and shell-guns. By these means it is hoped that the traverses on the hostile ramparts will be destroyed, the guns dismounted, and the defenders dispersed, before the final approaches bring the

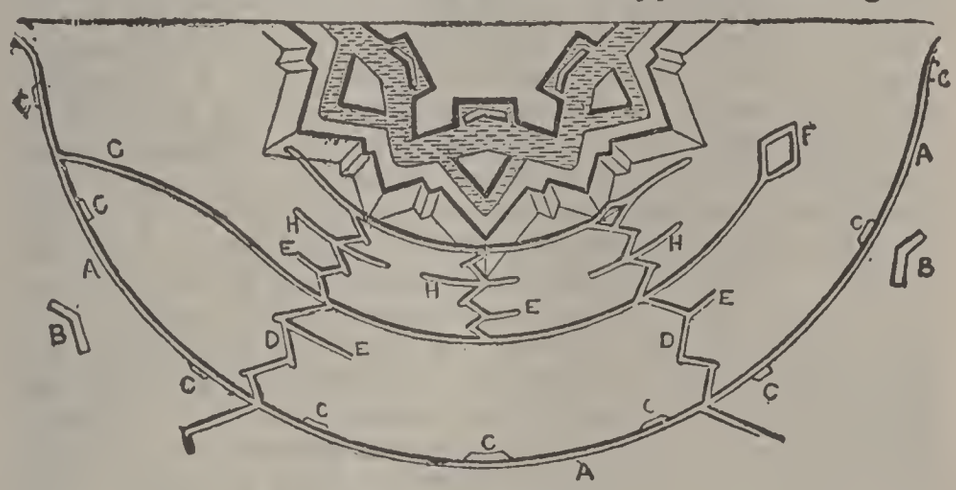


Fig. 2.—Siege Works.

assailants to the covered-way. The sappers will now commence their advance toward the points, or salient angles, of the two bastions to be attacked. If, however, the trench were cut straight toward the fortress, its guns could easily destroy the workmen, and enfilade the approach. To prevent this, it is cut in short zigzags—as at D—the direction always being to a point a few yards beyond the outmost flanking works of the garrison. The site of each trench nearest the fortress is protected by gabions and sandbags, as in the case of the parallel. At intervals, short spurs of trench, incipient parallels, are cut, as at E, to contain small-arms-men, to act as guards to the sappers. The second parallel is about 300 yards (though this varies with circumstances) from the enemy's works, and has to be more strongly formed than the first. It often terminates in a redoubt, F, to hold some light artillery, and a strong force of infantry, who could assail any sortie in flank; or it may run into the first parallel, as G, giving easier access for troops than through the zigzags. The second parallel is riveted with sandbags, in which loopholes are left for musketry. After passing the second par-

Fig. 3.—Double Sap.

allel, the angles of the zigzags become more acute, to prevent enfilading. At about 150 yards certain demi-parallels, H, are cut, and armed with howitzer batteries, to clear the covered-way, while riflemen also act from it. The third parallel is at the foot of the glacis. Thence the place, after being sufficiently battered, is taken by a storming-party, who make their way over the glacis, or the covered-way is topped by the double sap, as in fig. 3; which is a safer plan for the army generally, though much more deadly to the sappers. When the crest of the covered-way has thus been reached, batteries of heavy artillery will be there established, for the purpose of breaching the walls of the ravelin and bastion; while miners will seek first to destroy the defenders' counter-mines (which would otherwise be likely to send these batteries into the air) and then will excavate a tunnel to the ditch, at the foot of the counter-scarp. If the breach becomes practicable, a storming-party will emerge from this tunnel or gallery, and seek to carry the opposite work by hard fighting. If inner works still subsist, which would tear assailants to pieces, the double sap may be continued across the ditch, if a dry ditch, right up the breach, that counter-batteries may be formed. If the ditch be wet, means must be adopted for a causeway or a bridge. By these means, however obstinate may be the defense, if the besieging force be sufficiently strong, and aid do not arrive from without, the ultimate success of the attack becomes certain. Vauban raised attack to a superiority above defense, first, by introduction of ricochet fire which sweeps a whole line; and secondly, by originating parallels. Before his time, the whole attack was conducted by zigzag approaches; in which the troops actually in front could be but few, and were therefore unable to withstand strong sorties of the garrison, who, in consequence, frequently broke out and destroyed the works of the besiegers, rendering a siege an uncertain operation.

In N. America a notable S. was that of Louisburg (q.v.), 1745. The S. of Boston by Gen. Washington with more than 20,000 troops began immediately after the battle of Bunker Hill, 1775, June 17, when a system of fortifications was extended gradually from the Mystic river around to Roxbury. The artillery was reinforced by 50 pieces brought on sleds from Ft. George by Gen. Knox. Washington waited for ice to afford the means of crossing the Back Bay; failing to realize this hope, he conceived (and carried out during a night bombardment, 1776, Mar. 17) the excellent strategy of seizing and fortifying Dorchester Heights, which commanded the harbor. By Mar. 10 he had fortified Nooks Hill, immediately overlooking the British works on the 'Neck.' Mar. 17 Gen. Howe with more than 9,000 soldiers evacuated, and on the 20th Washington entered the city. Two years later, 1778, Aug., the S. of Newport by Gen. Sullivan and the French was abandoned after it was well begun, in consequence of the arrival of a British fleet and reinforcements. The S. of Savannah, begun 1780, Sep. 16,

by Gen. Lincoln with 3,600 men and Count D'Estaing with 6,000 French, ended in an unsuccessful assault Oct. 9, after which the French, having offered aid for a limited time, withdrew for duty at the French W. India Islands, leaving Count Pulaski among the slain. In the S. of Charleston, S. C., the patriots were the besieged, 3,900 men under Gen. Lincoln surrendering 1780, May 12, after one month's investment by Gen. Clinton with 8,500. The decisive and successful S. of Yorktown by the allied forces, 16,400, under Gen. Washington, against Cornwallis with 8,500, extended from the environment, 1781, Sep. 29, to the surrender, Oct. 18 (see YORKTOWN, SIEGE OF).—In the civil war, a noted S. was that of Vicksburg, which place Gen. Sherman pronounced more difficult to capture than Sevastopol. Assaults proved unavailing, and after 1863, May 22, it was a regular S. till July 4, when Gen. Pemberton surrendered 32,000 men with all stores to Gen. Grant (see VICKSBURG, SIEGE OF). The S. of Petersburg, Va., preceding the downfall of the Confederacy, was siege-like in its proceedings from the last of June, 1864, till 1865, Mar. 25, but there was no complete investment of city or enemy (see PETERSBURG, SIEGE OF). See DONELSON, FORT.

SIEGEN, *sē'ghĕn:* manufacturing town of Prussia, in Westphalia, on the Sieg, 38 m. s.s.w. of Arnsberg. Its inhabitants are engaged in manufacturing leather, cotton, and woolen goods. S. is said to produce also the best iron in w. Germany. In the vicinity are numerous iron mines and smelting furnaces. Its iron and steel wares are noted, especially its files. Pop. 22,000.

SIEGERT, *sē'ghĕrt,* KARL AUGUST: painter: 1820, May 5—1883, Oct. 17; b. Neuwied, Prussia. At the age of 17 he began the study of painting at Düsseldorf, under Hildebrandt, with whom he remained four years, and then continued his studies at the acad. in that city till 1846. He spent some years in foreign travel, and 1851 was appointed prof. of painting at the Düsseldorf Acad. Some of his *genre* pictures brought him great and deserved fame. Among his principal works were the *Dinner Hour, Sunday Morning,* and *A Lay Brother Distributing Alms.*

SIEG'FRIED: see NIBELUNGENLIED.

SIEMENS, *sē'menz.* ERNST WERNER: German physicist and inventor: 1816, Dec. 13—1892, Dec. 6: b. Lenthe. While artillery-officer, he patented a process for electroplating 1841; later made improvements in the electromagnetic telegraph, and established at Berlin the firm of Siemens & Halske for building the same. He was the first to fire submarine mines by electricity 1848, and invented methods of locating injuries to submarine cables, and lessening disturbance from induced currents; also gutta-percha appliances, relays, the 'Siemens' armatures for electric locomotives, the pneumatic postal tube, a registering alcoholometer, etc. In pure science he published a new theory of volcanic phenomena, founded on experiments relating to change of volume in glass and other silicates. In 1886 he read before the Acad. a memoir on the

conservation of energy as illustrated in terrestrial and meteorological phenomena; also, before the German congress of naturalists, an essay on synthesis of aliments from elements by help of electricity. He offered to the state $119,000 toward founding an institution of technical physics. He was elected a mem. of the Acad. of Science of Berlin 1874, and received the honorary degree of doctor from the Univ. of Heidelberg 1886.

SIE'MENS, KARL WILHELM; known as Sir WILLIAM S.: civil engineer and inventor: 1823, Apr. 4—1883, Nov. 19: b. Lenthe; bro. of Ernst Werner S. He studied at Göttingen and the Magdeburg Polytechnic School, worked in the machine-shops of Count Stolberg, and settled in London 1843, becoming later the London partner of his brother Ernst Werner, in concert with whom and his brother Friedrich he made many inventions and investigations, credit for which is due to the three together. But to him chiefly is due the regenerating gas-furnace, dating from experiments in 1846. The Siemens steel-works were built in Landore, Wales, 1869, with capacity of 1,000 tons of cast-steel every week, produced in part from the ore directly by the Siemens method. Among the inventions due to him alone or in collaboration are the marine bathometer, the hydraulic gun-brake to counteract recoil, an electrical pyrometer, a chronometric regulator (adopted in the royal observatory), a process for reproducing print, a double cylinder air-pump, a water-meter, etc.; besides the electric locomotive, etc., of the three brothers. He published, among other memoirs, one on the conservation of heat in mechanical work, another on resistance to electrical absorption under pressure; also on conservation of solar energy. His collected works, *Gesammelte Abhandlungen und Vortrage*, were pub. 1885. He was knighted by Queen Victoria; and his funeral occurred at Westminster Abbey.—FRIEDRICH S., bro. of the preceding, b. Menzendorf, near Lubeck, 1826, Dec. 8, besides participating in the inventions of his brothers, applied the regenerating gas-furnace to the manufacture of glass, succeeded his brother Jean as director of the Dresden glass-works, and controlled four works in Bohemia, employing 4,000 workmen. He has written on heating by radiation, distribution of light and heat, temper of glass, dissociation, and combustion.

SIE'MENS' FURNACE: see GLASS.

SIENA, *sē-ā'nâ*. city of central Italy, 60 m. s. of Florence. It is on three little hills, separated by valleys, and higher than the hills surrounding. Its climate is on this account very salubrious, notwithstanding the deficiency of water caused by its elevated position; to remedy which, subterranean aqueducts were long ago excavated, five m. in length, some dating as far back as the Roman dominion. Its environs are not beautiful, consisting of naked clay-hills, capped with sandstone; but the city is surrounded by trees and avenues, which have a fine effect. The hand-

some square, Piazza del Campo, is one of the finest in Italy: 11 streets lead out of it, and it is surrounded by handsome buildings. In this square is also the famous tower called the *Mangia*, of prodigious height; there are also other towers here and there, seen from a great distance—remnants of the habitations of the feudal lords. The streets are narrow, some paved with tessellated bricks, others flagged. There are many ancient Gothic palaces, not remarkably handsome. In the Piazza del Campo stands the Palazzo Pubblico, built in the 13th c., in which are magnificent rooms, and paintings by eminent artists. S. has a fine cathedral, erected, it is said, on the foundations of the Temple of Minerva; it was begun 1059, the facade dating from the 13th c. It is faced with black and white marble, and covered with ornaments and sculptures. The pavement is of marble tessellated, representing many biblical subjects. In the different chapels and in the baptistry are frescoes, paintings, and statues, by distinguished masters. The other churches also are rich in works of art. Of the many oratorios, the most noteworthy is that of St. Catharine (q.v.), occupying the house of the saint. Pop. 28,355.

S. was founded as a Roman colony in the time of Julius Cæsar, under the name Sena, or Sena Julia. There are no remains of antiquity; and it does not appear to have been a place of importance until the middle ages, when it became one of the powerful city republics of Italy. It adhered to the Ghibellines, and in conjunction with the forces of Pisa defeated the Tuscan Guelfs in the memorable battle of Monte Aperto (1260). At the height of its greatness, it is said to have had a pop. of 200,000.—S. produced a 'school' of artists, of whom the most distinguished names are Guido da Siena, Simone Memmi, Sodoma, Beccafumi, and Baldassare Peruzzi.

SIENITE: see SYENITE.

SIENKIEWICZ, *sēn'kē-wēks*, HENRYK; 1845— ——; b. Lithuania: Polish novelist. He was educated at the Univ. of Warsaw, and 1876 attempted to found in California an ideal community of immigrant Poles. The scheme failed; he returned home, and turned to the writing of psychological novels and historical romances, among which are *With Fire and Sword* (1890); *The Deluge* (1892); and the vigorous and remarkable *Quo Vadis, a Narrative of the Time of Nero* (1896).

SIENNA, *sĭ-ĕn'na:* pigment made of *terra di Sienna* (Sienna earth), a compound of iron oxide and earthy matter. Sienna is of two kinds, raw and burnt, the latter being simply the earth exposed to red heat, so as to make it take up more oxygen: see BURNT SIENNA: TERRA.

SIERRA, n. *sĭ-ĕr'ră* [Sp. *sierra*, a saw, a ridge of mountains—from L. *serra*, a saw]: ridge or range of mountains with notched saw-like outline. *Note.*—*Sierra* is also said to be derived from Ar. *sehrah*, an uncultivated tract.

SIERRA LEONE, *sĭ-ĕ'ra lē-ō'nē* (Mountain of the Lion): British colonial settlement on the Sierra Leone coast, w. Africa. The settlement consists chiefly of a peninsula, just s. of the Sierra Leone river, on which the capital, Freetown, stands: the coast from Scarciaz river to the border of Liberia (180 m.) and the Islas de Los Sherboro and others; area stated at 4,000 sq.m. In 1896 a protectorate was established over a section of the Hinterland for a distance of 180 m. inland; area 30,000 sq.m.; pop. 1,000,000. Along the coast stretches a belt of rich low-lying land, and elsewhere in the colony are fertile tracts; but the interior is a mass of rugged mountains, with generally barren soil. The climate is humid and unhealthful—the wet season, May to Nov., being specially pestilential. Tropical fruits and plants grow luxuriantly in the favorable regions; and coffee, sugar, indigo, and cotton have been introduced by the British. In 1901 exports amounted to £304,010 ($1,477,488), chief articles being gold, cotton goods, ground-nuts, palm-oil, hides, palm-nuts, manufactured tobacco, and timber; imports £548,286 ($2,664,669), the chief articles were cotton goods (nearly one-half of the whole value), gunpowder, ready-made apparel, hardware, haberdashery and rum. The chief exports are benni-seed, cola-nuts, ginger, ground-nuts, hides, palm-kernels, palm-oil, rubber and gum copal. The colony is ruled by a governor appointed by the crown and assisted by a council. In 1866 Sierra Leone, the Gambia, the Gold Coast, and Lagos were placed under one general government, the 'Government of the West African Settlements'; but in 1874 the Gold Coast and Lagos were separated, and in 1888 Gambia.—Since 1804 the English Church Missionary Society has spent $2,500,000 in religious and educational work in the colony. In 1889 fortifications and barracks were completed on the coast, and the cable was extended to the Cape of Good Hope station; and 1890 a joint French and English expedition was fitted out for the purpose of delimiting the frontier.

The settlement of Sierra Leone was established 1787 when 470 destitute negroes were removed to it from London by a body of philanthropists; and 1,196 negroes were sent to it from Nova Scotia—the climate of which had proved too severe for them—1790. The pop. was increased by other bands of people of color; and since the abolition of the slave-trade, 1807, the slaves captured by British cruisers have been put ashore and settled here. Fourah Bay College, near Freetown, Wesleyan High School, Annie Walsh Memorial Female Institution, and the grammar school opened 1846 were the chief educational institutions. Pop. (1901) 76,655.

SIER'RA MADRE, *mâ'thrā:* central portions of the great chain of Cordilleras or Rocky Mountains, in Mexico, from lat. 19° to 25° n.; and in New Mexico, to the great w. range, from lat. 34° to 38° n. These ranges, not yet

fully explored, contain some of the richest silver mines in the world.

SIER'RA MORENA, *mō-rā'nâ:* mountain range in Spain, on the s. border of New Castle, between the modern provinces of Ciudad Real and Jaen. It separates the upper portions of the basins of the Guadiana on the n. and of the Guadalquivir on the s., and rises in its highest point to 5,500 ft. above sea-level. It is frequently mentioned in *Don Quixote,* and is the scene of many of its incidents.

SIER'RA NEVADA, *nē-vâ'dâ* (*Snowy Range*): range of mountains in California, forming a portion of its e. boundary; the source of a multitude of rivers, which swell the Sacramento and San Joaquin. The range extends from n.w. to s.e. 450 m., and is united to the Coast Range, which runs parallel with the Pacific, by Mt. San Bernardino (see CALIFORNIA). Among the higher peaks of the Sierra Nevada are Mt. Whitney (highest mountain in U. S. part from Alaska), 14,887 ft. high; Mt. Shasta, 14,442; Mt. Tyndall, 14,386. There are immense deposits of gold quartz, with steam and water power crushing mills; also some copper.

SIER'RA NEVADA, *nā-vâ'thâ* (*Snowy Range*): mountain range of Spain, in Andalusia, extending e. from Padul, 12 m. s. of Granada, to the frontiers of the modern province of Almeria; 60 m. in length, 20 to 30 m. in breadth; more than 1,000 sq.m. It is continued on the n.e. by the Sierra de la Filabras, and forms a portion of the watershed between the streams that flow into the Mediterranean and those that flow into the Atlantic. The peak of Mulhacen reaches a height of 11,678 ft., the highest summit not only of the Spanish Peninsula, but of the whole of Europe w. of the Alps. The peak of Veleta is 11,387 ft. high. The range receives its name from the perpetual snow which covers the highest summits.

SIESTA, n. *sĭ-ĕs'tă* [Sp. *siesta;* L. *sexta* (*hora*), the sixth hour—that is, noon]: the midday or after-dinner nap.

SIEUR, n. *syėr* [F. *sieur,* lord of the manor—contracted from *seigneur* (see SEIGNIOR)]: sir; a title of respect used by the French.

SIEVE, n. *sĭv* [AS. *sife;* Low Ger. *seve;* Dut. *zeef;* Ger. *sieb,* a sieve: Icel. *sef;* Dan. *siv,* sedge or rush—the *sieve* having been originally made of rushes]: a utensil, generally in shape like the head of a drum, covered with hair or a material with open meshes, for separating flour from bran, or the smaller particles of anything from the large; a bolter; a basket used as a measure.

SIEVE OF ERATOSTHENES: a method invented by Eratosthenes (B.C. 276-194) for sorting out prime numbers. It consisted in writing down all the odd numbers from 3 on, and then striking out all multiples of 3, 5, 7.

SIEYÈS, *sē-yĕs'*, EMMANUEL JOSEPH, Comte: prominent figure, as the Abbé Sieyès, in the history of the French Revolution: 1748, May 3—1836, June 20; b. Fréjus. He was educated at the University of Paris with a view to his entering the priesthood, and obtained the appointment at Treguier, in Bretagne (1775), whence 1780 he was transferred to the cathedral of Chartres, of which diocese he became chancellor and vicar-general. He had early imbibed extreme liberal opinions on all matters social and political, which were preparing the French Revolution; and when, 1789, the states-general were summoned, he issued his famous pamphlet, *Qu'est-ce que le Tiers Etat?* This work, which claimed for the people political recognition, naturally obtained immense popularity for its author, and procured his election as one of the deputies for Paris. Mainly through his urgency and influence it was that, 1789, June 16, the representatives of the people took the decisive step of constituting themselves into an independent body, and became the national assembly. Of this body he continued for some time to be one of the most prominent figures. In 1791 he was elected to the legislative assembly, then convened, as member for the department of Paris. By this time, however, he had sunk from his first pre-eminence; bolder and fiercer spirits had passed him in the race for power and popularity, and where he had once led he now reluctantly followed. In the convention of 1792, to which he was elected as deputy of the department of La Sarthe, he prudently refrained from active participation in the debates, and at the king's trial he recorded a silent vote. While Robespierre and his party were in power, he consulted his safety by retiring from Paris. When afterward asked what he had done during the Reign of Terror, he quietly replied: *J'ai vécu* ('I have lived'). On the fall of Robespierre, he returned to his post in the convention, and became a member of the new committee of public safety. He was engaged chiefly in the department of foreign policy, and went as ambassador to Holland and Berlin successively to negotiate treaties of alliance. He became a member of the directory 1799, and, among other reactionary measures, he succeeded in closing the celebrated Jacobin Club. Perceiving that a stable government was on no other terms possible, he became anxious to secure the co-operation of some powerful military leader, particularly as he was ambitious above all things of giving France a 'constitution' (of which he had drawn up one or several); and on the return of Bonaparte from Egypt, he entered into a league with him, whose result was the revolution of 18th Brumaire (1799, Nov. 9), and the institution of the consulate—Sieyès, Napoleon, and Roger Ducos being the three first consuls. Speedily, however, Sieyès discovered in his new ally his master. As to the distribution of power in the new constitution to be formed, he and Napoleon differed irrecon-

cilabiy; the man of bayonets was the stronger; Sieyès's political nostrums never got beyond the paper on which they were written, and finally, in disgust at his subordinate position, Sieyès threw up his place in the government. As a reward of his services, he received on his retirement 600,000 francs and the estate of Crosne, afterward exchanged for a splendid hotel in Paris and the lands of Fainanderie, in the park of Versailles. Also the title Count was conferred on him. Subsequently the presidency of the senate was offered him, but he declined it, and never afterward concerned himself in public affairs. Banished at the Restoration, he did not return to France till after the revolution of 1830; and died in Paris. Mignet's *Histoire de la Révolution* contains a description of Sieyès's proposed constitution; and under the title *Théorie Constitutionelle* of Sieyès, and *Constitution de l'An VIII.*, M. Boulay (de la Meurthe) pub. (Par. 1836) from Sieyès's own *Mémoires inédits* a more detailed account.

SIFT, v. *sĭft* [see SIEVE]: to separate by shaking a sieve; to pass through a sieve; to examine minutely or critically. SIFT'ING, imp.: N. act of one who sifts or uses a sieve. SIFT'ED, pp. SIFT'ER, n. *-ėr*, he or that which sifts. SIFT'INGS, n. plu. the dust and smaller particles separated from a commodity, as tea-siftings.

SIGAULTIAN, a. *sĭ-gōl'shĭ-ăn* [from *Sigault*, a French surgeon who first performed the operation]: applied to the surgical operation of enlarging the capacity of the pelvis in cases of impracticable labor.

SIGEL, *sē'ghėl*, FRANZ: soldier: born Sinsheim, Baden, 1824, Nov. 18; d. 1902, Aug. 21. He graduated from the Carlsruhe military school 1843, entered the army, and had reached the rank of lieutenant 1847, when he killed a man in a duel, and resigned his commission with the intention of studying law at Heidelberg, but 1848 joined an unsuccessful rebellion against the government, and had to flee from the country. He returned to engage in another insurrection 1849, was appointed minister of war, and became chief commander of the revolutionary forces. When the provisional government was overthrown, he took refuge in Switzerland, but was expelled from that country 1851. After living in England about a year, he came to New York, and engaged in teaching and in literary work. He removed to St. Louis 1858 to teach in the German Institute, became a member of the board of education, and was connected with a military journal. At the opening of the civil war, he organized troops for the Union army, was commissioned colonel, rendered efficient service in Missouri and Arkansas, was in command of forces in Virginia 1862, in Pennsylvania 1863, and of the department of West Virginia 1864. He was appointed brigadier-general 1861, May 17; major-general 1862, Mar. 21; and resigned from the army 1865, May 4.

He was register of New York 1871-74, pension agent in that city 1886-89.

SIGH, n. *sī* [AS. *sican;* Sw. *sucka;* Dan. *sukke;* W. *igio,* to sigh or sob: Ger. *seufzen;* Low Ger. *suchten,* to sigh: Scot. *souch,* the sound of the wind, or of one breathing heavily: imitative words]: a deep, long-drawn, and audible respiration, as in grief or pain: V. to express by sighs; to inhale and respire a long breath audibly, as in grief or pain; to grieve. SIGH'ING, imp.: N. the act of taking a long and audible breath; expression of grief. *Sighing* is nothing more than a very long-drawn inspiration, in which a larger quantity of air than usual is made to enter the lungs. This is continually taking place to a moderate degree, and Dr. Carpenter remarks that it occurs particularly when the attention is released after having been fixed on an object which has strongly excited it and thus has prevented the person from feeling the insufficiency of the ordinary movements of respiration. Hence this action is often a simple result of deficient aëration; while in other cases it is excited by a depressed state of the feelings. SIGHED, pp. *sīd.* SIGH'INGLY, ad. *-lĭ.*

SIGHT, n. *sīt* [AS. *gesiht;* Dan. *sigte;* Sw. *sigt,* sight: Ger. *sehen,* to view]: act or faculty of seeing; perception of objects by the eye (see SIGHT, DEFECTS OF): view; a being within the limits of vision; that which is beheld; a spectacle; a show; knowledge from seeing; a small aperture through which a thing is seen, as the eye-piece of a quadrant; a small piece of metal fixed on the muzzle of a gun to guide the eye in taking aim (see GUNNERY): in *OE.,* a large number; a multitude: V. to look at through a sight; to see accurately; to gain the proper elevation and direction to by means of a sight; in *nautical language,* to come in sight of. SIGHT'ING, imp. SIGHT'ED, a. seeing in a particular way, as near-*sighted.* SIGHT'-LESS, a. *-lĕs,* wanting sight; blind; in *OE.,* offensive to the eye; unpleasant to look at; invisible. SIGHT'LESSLY, ad. *-lĭ.* SIGHT'LESSNESS, n. *-nĕs,* the state of being sightless; want of sight. SIGHT'LY, a. *-lĭ,* pleasing to the eye; comely. SIGHT'LINESS, n. *-lĭ-nĕs,* the state of being sightly; comeliness. TO COME IN SIGHT, to obtain a view of, as land. AT SIGHT, when presented, and AFTER SIGHT, when the time mentioned has expired, said of commercial bills and notes of exchange. SIGHT-SEEING, a. given to seeing sights: N. the act of seeing sights; eagerness for seeing novelties or curiosities. SIGHT-SEER, one given to seeing sights.—SYN. of 'sight, n.': view; vision; show; spectacle; exhibition; representation; notice; knowledge; eye.

SIGHT, DEFECTS OF: impairments of the optical apparatus: only such impairments are considered here as are due to some known or unknown peculiarity of the optical apparatus (including the optic nerve) not dependent on disease—viz., *short-sight, long-sight, astigmatism,* and *double vision.* See EYE, DISEASES OF THE.

Short-sight, near-sight, or *myopia* [from Gr. words *myō*, I close; *ōps*, the eye]: is often popularly confounded with dim or weak sight; but, in reality, short-sight applies exclusively to the *range* and not to the *power* of sight, and a short-sighted person may possess the acutest power of vision for near objects. In this affection the parallel rays, or those which come from distant objects, which ought to come to a focus upon the retina converge to a point more or less in front of it. The cause of this defect probably differs in different persons. It may arise from over-convexity of the cornea or the lens, from undue density or abundance of the humors of the eye, from an imperfect power of the eye to adjust itself to objects at various distances, or from an elongation of the posterior part of the eye. The distance at which objects are perceived most distinctly by the perfectly normal eye ranges from 16 to 20 inches; an eye which cannot perceive objects distinctly beyond 10 inches is to be regarded as short-sighted; in extreme cases the point of distinct vision may be three, two, or even only one inch from the eye. Short-sight is strongly hereditary: it seldom appears before the age of 7; after 25 years it seldom advances; but sometimes it does advance till at the age of 50 or earlier, unless the defect has been corrected by the use of properly fitting glasses, the power of vision may be utterly lost, whether through separation of the retina, from effusion of the blood, or from atrophy and degeneration of the yellow spot. The frequency of this affection in the cultivated ranks points directly to its principal cause—tension of the eyes for near objects. An investigation made by the statistical bureau of Munich (1891) shows that, of every thousand boys in the 1st or elementary class of the Munich schools, 36 are short-sighted; in the 2d class, 49; in the 3d, 70; in the 4th, 94; in the 5th, 108; in the 6th, 104; in the 7th and last, 108. In the case of girls, the increase is from 37 to 119. Three factors are at work in producing or increasing myopia: 1. Pressure of the muscles on the eyeball in strong convergence of the visual axes; 2. Increased pressure of the fluids resulting from accumulation of blood in the eyes in the stooping position; 3. Congestive processes in the base of the eye, which, leading to softening, give rise to extension of the membranes. That in increased pressure the extension occurs principally at the posterior pole is explained by the want of support from the muscles of the eye at that part. Now, in connection with the causes mentioned, the injurious effect of fine work is, by imperfect illumination, still more increased; for thus it is rendered necessary that the work be brought closer to the eyes, and that the stooping position of the head, particularly in reading and writing, be also increased. Hence it is that in schools where, by bad light, the pupils read bad print in the evening, or write with pale ink, the foundation of myopia is mainly laid.

In the treatment of myopia, the principal objects are: 1. To prevent its further development and the occurrence of secondary disturbances; and 2. By means of suitable glasses to render the use of the myopic eye easier and safer.

1. To effect, if possible, the first object, the patient must look much at a distance; but as we cannot absolutely forbid his looking at near objects, spectacles must be provided which render vision distinct at from 16 to 18 inches. Moreover, it is desirable that at intervals of a half-hour work should be discontinued for a couple of minutes; and no working in a stooping position should be permitted. The patient should read with the book in the hand, and in writing should use a high and sloping desk.

2. The optical remedy for short-sight obviously consists in concave glasses of a focus suited to the individual case. At first sight, it might be supposed that glasses with a concavity exactly sufficient to neutralize the defect in the eye would always suffice; but so many circumstances may forbid the complete neutralization of the myopia that an oculist of reputation should always be consulted as to the choice of spectacles. Glasses injudiciously selected usually aggravate the evil that they are intended to remedy.

Long-sight, hypermetropia, or *presbyopia,* is produced by parallel rays that enter the eye meeting in a point behind the retina: it is a condition usually attending advanced years (hence the name, from *presbus,* old person, and *ops*). It is in most cases due to shortening of the axis of the eye; but sometimes to absence of the lens. In this state, the nearest point of distinct binocular vision is about 8 inches (or double the ordinary distance) from the eye. This condition, which is as natural a concomitant of advanced life as gray hairs or wrinkles, is occasionally met in young persons: such cases should be carefully watched. In ordinary presbyopia, the defect is at once remedied by the use of glasses of low convex power, as of 30 or 24 inches focus, which should, however, be worn only during reading and writing, and not constantly. As in the fitting of glasses for myopia or for any other defect of vision, so in hypermetropia this delicate operation should always be entrusted to the oculist, for great and lasting harm may be done by incorrectly adjusted glasses. The most serious defect of vision, because of the headache, stomach trouble, and nervous affections which it may cause if not corrected by glasses, is *astigmatism.* This is due to an irregularity in the curvature of the cornea or the crystalline lens whereby the object looked at is distorted in one or the other axis in consequence of the rays being focused at unequal distances from the retina. The disturbing effects of this visual defect can be obviated only by the most carefully and scientifically adjusted glasses of complex curvature,

and for the proper selection and prescription of these glasses one should go only to a competent oculist. The haphazard fitting of glasses for this trouble, simply because they *seem* to be right and to give good vision is most unwise and may work serious and irreparable injury.

Double vision may occur from lack of harmony in the movements of the two eyes, the vision of each eye singly being perfect; or there may be double vision with one eye only. The first form may occur (1) in cases of squinting, or (2) in cases of paralysis of one or more of the muscles of the orbit. In cases of squinting (q.v.), the vision of the most distorted eye is almost always imperfect, and a person with a bad squint sees objects with the sound eye only. But if the sight of both eyes is nearly equal, as often is the case when the squint is not very well marked, double vision results whenever both eyes are employed together, in consequence of images of nearly equal intensity falling on non-corresponding parts of the two retinæ. When double vision arises from muscular paralysis, disease of the brain of a serious nature is to be apprehended, though the affection sometimes appears to arise from exposure to cold. The second form of double vision—viz., double vision with a single eye—is a much more rare affection than the preceding one, and depends upon some irregular refraction of the cornea or lens.

SIGILLARIA, n. *sĭj'ĭl-lā'rĭ-ă* [L. *sĭgil'la,* little figures or images—from *signum,* a mark, an image: It. *sigillo,* a seal]: genus of fossil plants, important because of their singular structure and their remarkable abundance in the coal-measures. They seem to have contributed more than any other genus of woody plants to the formation of coal. The roots of Sigillaria are found preserved in the shale which forms the floor of all coal-seams. These roots were originally supposed to be distinct plants, and have received the generic name Stigmaria: the notion formerly accepted regarding them was that they were fleshy water-plants, with numerous linear leaves, articulated to the stem by papillæ, which were buried in deep cylindrical hollows in the stem. Brongniart first suspected that they were roots, and Dr. Charles Thomas Jackson of Boston, and Binney, placed the question beyond doubt by discovering a specimen in which the trunk of a Sigillaria rose from the crown of a Stigmaria. Several observers have subsequently seen these fossils also in actual contact; and the general opinion is that the Stigmarias were under-ground stems. The stems of Sigillaria are abundant in the coal-beds. They are marked by parallel longitudinal flutings and regular scars formed by the bases of the leaf-stalks, which had fallen off. They are known to have attained a height of 70 ft. and a diameter of 5 ft. The stem rose without branching till near the summit, when it branched several times dichotomously. The pro-

portion of woody matter to cellular tissue in the stem was very small. The woody fibre is characterized by abundance of scalariform vessels, similar to those in *Lepidodendron* and in the recent vascular Cryptogamia. The stem is seldom found preserved so as to exhibit any structure, or even its cylindrical form; it generally occurs as a double layer of coal, showing on the outer surfaces the scars produced by the bases of the leaf-stalks. The form and arrangement of these scars have been used to distinguish the species. Its affinities are probably near to *Lepidodendron*, and some of the numerous fragments which have been referred to this genus may really be the branches of Sigillaria. It has been restored as a huge *Lycopodium*, and some of those fruits which, under the names of *Lepidostrobus* and *Flemingites*, have been described by Brown, Hooker, and Carruthers, doubtless belong to it.

SIGISMUND: king of Poland: b. 1520, Aug. 1; d. Knyszyn 1572, July 14. He was son of Sigismund I., and was appointed king in 1529, in the lifetime of his father, and in 1544 obtained the government of Lithuania. His mother, Bona Sforza, allowed him to grow up in luxury and effieminacy that she might be able to continue her influence during the government of her son; but upon his accession he disappointed her expectations. When by the revival of ancient laws he proceeded firmly in curtailing the powers of the nobility they endeavored unsuccessfully to depose him. Under Sigismund the Reformation made great progress in Poland. In 1563 Sigismund gave toleration to the different religious parties, and in 1572, at the diet of Warsaw, proclaimed universal religious freedom.

SIGISMUND: king of Poland and Sweden: b. 1566; d. Warsaw 1632. He was the only son of John III., king of Sweden, and of the Polish princess Catharina, a sister of Augustus Sigismund II. After the death of Stephen Bathori he was invited, in 1587, to become king of Poland, and having sworn the Pacta Conventa was crowned at Cracow. On the death of his father, John III., in 1592, he set out for Sweden to take possession of the throne to which he had succeeded, and was crowned in 1594. On his return to Poland he was obliged to leave Sweden under the regency of his uncle, who ultimately reigned over it as Charles IX. Sigismund's refusal to give up the Swedish crown of which he became deprived, involved Poland in a disastrous war with Sweden, which lasted for 60 years.

SIGISMUND, *sĭj'ĭs-mŭnd*, Emperor of Germany: (reigned 1411-37) d. 1437; son of Emperor Karl IV. He was well educated; and having married Maria of Anjou, on her accession to the throne of Hungary he became chief administrator of that kingdom. The death of his wife 1392 made him king of Hungary; and at the head of an

army of more than 100,000 Hungarians, French, Germans, and Poles, he attempted to relieve the Byzantine empire from the fierce Turks, but was terribly defeated at Nicopolis, 1396, Sep. 28. On his return to Hungary, he found on the throne a new monarch, Ladislas of Naples, who imprisoned him (1401); but through the good offices of his elder brother, Wenceslas, he was freed, and obtained the throne (1402), rewarding his elder brother by snatching from him his kingdom of Bohemia. In 1410 he was elected emperor, on the death of Rupert, but was not fully recognized till 1411. The important events of his reign were ecclesiastical. He was present at the Council of Constance, which he had prevailed upon Pope John XXIII. to hold for the purpose of putting an end to the Hussite and other schisms. He contented himself with protesting against the violation of the imperial safe-conduct which had been given to Huss; and ultimately consented to his judicial murder, for the purpose, as his apologists say, of conciliating the council, and so settling the disputes concerning the papacy. This atrocious act enraged the Bohemians, and his succession to the throne of Bohemia after his brother's death was opposed by the Hussites, who were now in insurrection; and after a fruitless attempt to conquer them, he confined himself to the defense of Hungary against the Turks, whom he defeated in a great battle near Nissa (1419). For ten years afterward he left Germany much to the guidance of its self-willed petty rulers, who speedily brought the country into such a deplorable state that they were glad to beseech S. to return to the helm of affairs—which he did, but with little good effect. He obtained, by concessions to the Calixtines (q.v.), the crown of Bohemia 1436; but on coming to the throne, he gradually withdrew these concessions; which provoked such discontent that only his death averted a civil war. S. had intelligence and political talents, but these were neutralized by his impetuosity, indecision, selfishness, and extraordinary avarice; and his well-meaning endeavors after peace and improvement ended in nothing. Carlyle distinguishes S. by the epithet *Supra Grammaticam*, in allusion to his answer to a cardinal at the Council of Constance, who ventured to correct his majesty's grammar—'I am the Roman king, and above grammar.'

SIG'ISMUND, THE GREAT, King of Poland: 1467–1548, Apr. 1 (reigned 1506–48); b. Koziénicé; youngest son of Casimir IV. He was chosen Grand Duke of Lithuania 1506, and succeeded to the kingdom of Poland Dec. 8. The affairs of Poland and Lithuania were in a sad condition; the s. portions of the country reduced almost to a desert by the ravages of the Tartars, while the e. was continually in dread of the Russians, who had become an independent, united, and powerful monarchy. The Russians invaded Lithuania, and conquered some provinces; but S gained a brilliant victory over them at Orsza, on the Dnieper, 1508, July 14. Bogdan, Prince of Moldavia and Walachia, now invaded the s. provinces, as that semi-barbarous race had been accustomed to do without hindrance;

but he was so decisively routed on the banks of the Dniester that he agreed to acknowledge himself a vassal of Poland. Disregarding the suggestions of the pope to head a crusade against the Turks, S. 1512 taught the Tartars, through his gen., Ostrogski, a forcible lesson against aggressive practices which cost them 27,000 men, and assured the tranquillity of his frontier for a long period. His alliance 1513 with Stephen Zapoli, voyvode of Transylvania, whose daughter Barbara he married, alarmed Emperor Maximilian, who incited the Russians to resume their aggressions, which that ill-advised nation cheerfully agreed to do, paying dearly for their rashness, for their army of 80,000, which had invaded Lithuania, was met and cut to pieces 1514, Sep. 8, by Ostrogski with 32,000 men, at Orsza, leaving its standards, cannons, and other arms, 2 generals, 37 princes, 6,000 prisoners, and 30,000 dead in the possession of the enemy. Subsequent invasions of Moscovites and Tartars were repelled as before, and a rebellion of the Walachs was punished by numerous defeats, chief of which was that of Obertyn (1531). The insolence of the Teutonic Order in invading Polish Prussia, was effectually chastised by S., who defeated their Grand Master Albert, his own nephew, in two great battles, in the latter of which the knights were assisted by the Danes (1520). In 1525 he agreed to confer on Albert the title Duke of Prussia (now known as East Prussia), on condition of fealty and homage: the dukes of Prussia continued vassals of the Polish crown till 1657. In 1526 S. alone of the monarchs of Christendom lent aid to Hungary against the formidable array of Solyman the Magnificent, and a numerous force of Polish cavaliers fought bravely on the fatal field of Mohacz (1526). The only other important event of S.'s reign was the introduction and extension of Lutheranism in Poland—which S. did nothing to prevent, only taking precautions, sometimes severe, against its affecting the civil and political condition of the country. It is told of him that, when John Eck exhorted him to take severe measures with the Lutherans, whom he compared to goats among the sheep ('the faithful Catholics'), S. replied that he was desirous of being 'king of goats as well as king of sheep.' After a long and glorious reign, S died at Cracow, leaving the character of a just, wise, and magnanimous prince, who had restored to his country its ancient prosperity, and had raised it from the very feet of its enemies to a commanding power over them.

SIGLA, n. plu. *sĭg'la* [L.]: the signs, characters, abbreviations, or letters used for words in ancient manuscripts, printing, coins, medals, and the like.

SIGMA, n. *sĭg'mă* [the Greek letter Σ or ς]: the Greek letter = Eng. S. SIG'MOID, a. *-moyd*, or SIGMOID'AL, a. *-moyd'ăl* [Gr. *sigma*, the letter S, and *eidos*, a form]: curved like the Greek Σ; in *anat.*, applied to several structures in the body, from their shape; in *bot.*, curved in two directions like the letter S, or the Greek Σ. SIGMATE, v. *sĭg'māt*, to increase by adding the letter sigma.

SIGMARINGEN: see HOHENZOLLERN.

SIGN, n. *sīn* [F. *signe*, a sign, a signature—from L. *signum*, a mark]: that by which a thing is known; a token, a wonder, a miracle; a symbol; a gesture instead of words; any significant mark; something intended to serve as a proof or type; indication; a picture or symbol set up on a house to show the tenant's occupation; a visible representation, in *astron.*, the twelfth part of the ecliptic; in *alg.*, a character or symbol indicating the relation between quantities, in *med.*, anything by which the presence of disease is made known. V. to attach one's name to; to ratify by signature or seal; to indicate by a sign; in *OE.*, to be a sign or omen. SIGN'ING, imp.: N. act of one who signs or affixes a signature (see SIGNING, SEALING, AND DELIVERY). SIGNED, pp. *sīnd*. SIGN'ER, n. *-ĕr*, one who signs. SIGN-BOARD, a board hung up with painted designs to indicate a man's calling. SIGN-MANUAL, signature in handwriting, authenticating a document. SIGN-MANUAL, ROYAL, superscription or subscription of the sovereign, which in Britain must be adhibited to all writs which have to pass the privy seal or great seal. The sign-manual, in practice, consists but of the initial of the sovereign's name, with the letter R added, for *Rex* or *Regina*. SIGN-POST, a post or pillar on which a sign is hung. SIGNS OF THE TIMES, occurrences which indicate coming events. SIGNS OF THE ZODIAC, Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces, each of which see. NATURAL SIGNS, pantomimic and other easily understood signs to represent things.—SYN. of 'sign, n.': token; emblem; wonder; miracle; prodigy; monument; memorial; constellation; note; mark; symbol; representation; device; symptom; indication; type; omen; prognostic; presage; manifestation.

SIGNAL, n. *sĭg'năl* [F. *signal*, a signal—from mid. L. *signālĕ*—from L. *signum*, a sign]: anything employed to attract the eye or ear of others at a distance; notice given by a sign (see SIGNALS): in *OE.*, token: ADJ. distinguished from what is ordinary; memorable; notable: V. to convey by signals. SIG'NALLING, imp. SIG'NALLED, pp. *-năld*. SIG'NALS, n. plu. *-năls*, a system of signs or tokens addressed to the eye, as flags, boards, lights, etc., for establishing communications at distances (see below)—now generally superseded on land by the electric Telegraph (q.v.). SIG'NALLY, ad. *-lĭ*, eminently; remarkably. SIG'NALIZE, v. *-năl-īz*, to make remarkable; to render distinguished above what is common. SIG'NALIZING, imp. SIG'NALIZED, pp. *-īzd*. SIGNAL-FIRE, a fire intended for a signal. SIGNALMAN, a man who has the charge of a signal or set of signals. SIGNAL POST or STAFF, a long pole upon which a flag or pendant may be displayed for conveying signals.—SYN. of 'signal, a.': remarkable; memorable; notable; conspicuous; eminent; extraordinary.

SIGNALS.

SIG'NALS. means of rapidly transmitting intelligence to a greater or less distance by the agency of sight or hearing. Incomparably the most powerful medium yet known for this purpose is the electric current: see TELEGRAPH Sound-S. have obviously but a short circuit. The electric current requires fixed apparatus establishing an actual communication between the two points, and is therefore inapplicable to the ordinary cases of ships interchanging S with one another or with the shore; and, except under unusual circumstances, it has not been found applicable to armies maneuvering in the field For these purposes, so far as present knowledge extends, S. by sight or sound must be the resort. For railway-S., see below: also RAILROADS.

The ancients seem to have elaborated a system of night S. by torches for military purposes; but in naval affairs the ships sailed so close together that orders could be communicated by word of mouth, while the turning of a shield from right to left sufficed as sailing directions to the several lines. In modern times, signalling between ships has become indispensable; but there is probably no department of practical science in which progress has been slower, and every so-called system has been distinctly lacking in system In the time of James II., a signal could be expressed only by flags, in confusing number, hung in different parts of the vessel. At the beginning of the 19th c. the system had been adopted of hanging a number of flags under one another, each symbol or combination having an arbitrary conventional meaning attached to it. Alterations in the specific flags have been made from time to time, but essentially this is the system now in naval use. The flags are either square, triangular of the same length, or pendants pointed and longer. These are black, white, red, blue, and yellow (in the Austrian service alone green is added), in mass or in combination. Specimens of the flags in use in the present naval code are shown in fig. 1. The signal-men find, however, that at a distance blue, red, and black are not readily distinguishable, nor yellow from white. It has

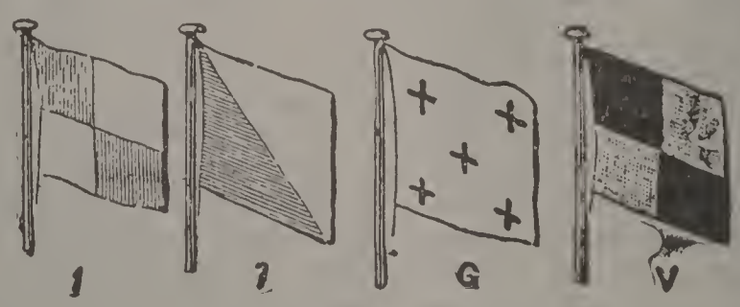


Fig. 1.

consequently been the recent tendency to reduce all the signs to black and white, singly or in combination, trusting to shape for different signals.

There are, however, disadvantages attending flags. In a still day, they are difficult to read; or the wind may so blow that they are seen only end on. At sea, the motion

of a ship will generally neutralize these drawbacks; but the case is otherwise on shore, and it may consequently occur that the ship can communicate to the land, but cannot get reply. To obviate this, S. representing solid figures are sometimes employed. To fulfil their conditions, they must appear the same in whatever lateral direction seen. But this limits the shapes to cylinders, cones, and the sphere, or to combinations of those figures; and as the total number of distinguishable signs is reduced, signalling becomes reduced from the word-signal to the telegraph. This distinction should be clearly understood, as much is involved in it. A word-signal, as in the present system, is where the whole word or message is sent up at once, and flies simultaneously; a telegraph-signal is one in which the letters composing the word, or number representing the signal, are shown separately, each being removed before another is shown. At sea, the word-system is best, for it involves no act of memory; and memory, even from signal to signal, is found difficult by signalmen in the turmoil of storm or fighting. On the other hand, the telegraph-system involves far simpler apparatus, and the changes can be effected more rapidly. As regards the actual time required for a message, the word-system has advantage in a message short enough for the whole to be shown at one time; otherwise the difference is not material. If all advantages be balanced, probably the telegraph-system will eventually supersede the other. Whether the word or the telegraph system be practiced, another question is, whether to spell each word, or to use numerals and a code. Under the latter principle, about 14,000 of the words and sentences most commonly sent are arranged for easy reference in the signal-book. With the addition of 1 or 2 repeating symbols, the 9 numerals and 0 give combinations 4 together to this number. A combination of figures is arbitrarily assigned to each expression; and the expression is communicated by representing those figures in their proper order. With the book of reference at hand, and intelligent signalmen, there can be no doubt of the superior rapidity of the 'code.' A code has this further advantage, that the S. representing things and not words, it can be made international, the same symbols representing the same idea in every language. It is then necessary for universal signalling only that each nation should concur in the meaning to be attached to the several signs. Much attention has been given of late years to the simplification of S.; the chief object having been so to simplify the telegraph-system that S. may be made with any apparatus, or without apparatus at all. To accomplish this, inventors have to a great extent abjured color, and resorted to form and motion. Among the form-telegraphs there is the principle of the old Semaphore (q.v.), in which each letter or number is shown by the position of two arms, as in fig. 2. The

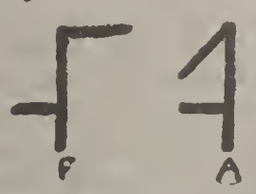


Fig. 2.—Semaphore System.

arms are heavy and involve mechanism; besides which, they are not always clear on a ship in motion beyond a short distance. Very superior in visibility and simplicity is Redl's System of Cones. This consists of 4 cones fixed to a mast. The cones are collapsable, and are formed in a similar manner to umbrellas. Their usual condition is shut, and they can be held open only while a rope attached to each is pulled. With cones of 3 ft. base, signalling is rapid and clear as far as 5 m., and the mast can be inserted at any place. The system is very simple: each cone represents a number, 1, 2, 3, or 4; then 1 and 4 shown represents 5; 2 and 4, 6; and so on, as in fig. 3. This elegant system can be applied in military or naval operations.

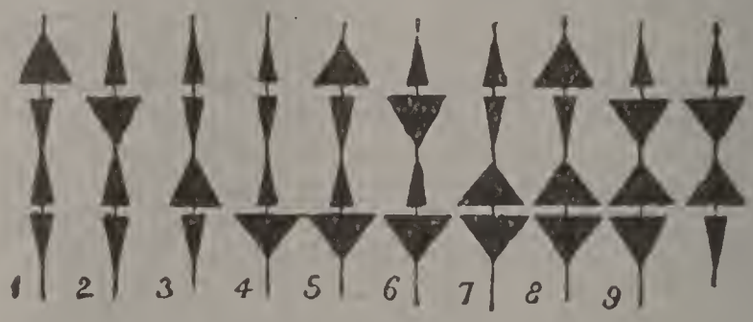


Fig. 3.—Cone System.

But its chief beauty is, that a person understanding it can make the same signals without the cones—e.g., if a black flag represent an open cone, and a white flag a shut cone, a ship with 4 black and 3 white flags can make every signal. Again, the arm raised horizontally may represent the open cone; against the body, the shut cone; then two men standing on a cliff are as good as any signal-post—

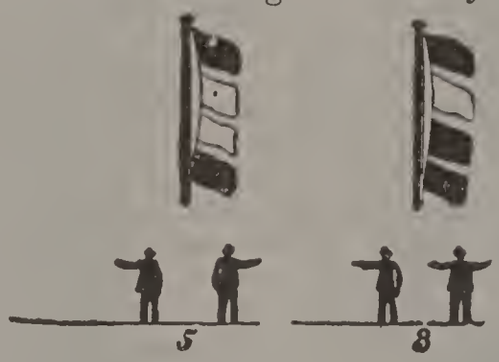


Fig. 4.

see fig. 4 Or if one person only be present, he may represent an open cone by raising his arm with a handkerchief extended, and a shut cone by his arm without the handkerchief. He has then only to raise his arm four times in quick succession, with or without the handkerchief, to make the required signal. We have thus arrived at a universal system of the utmost simplicity, which in war, and especially during invasion, might be of inestimable benefit if generally diffused by the government.

It remains to apply the same system to night-signals. The old naval principle has been to hang dingy lanterns in

various shapes—triangles, squares, crosses, etc. Besides requiring large bases to be at all visible, this has been found nearly useless by reason of the motion of a ship. Redl's system has been applied by hanging four lanterns in a vertical line to represent the cones, and obscuring those which corresponded to shut cones. An improvement was the introduction of a red or green light in the middle, to show the relative positions of the four. The best night-S. are, however, flashing lights, as introduced by Col. Bolton, and more elaborately by Capt. Colomb (both of the Brit. navy), and adopted in the navy. This signal consists of a bright light, covered by a shade, which shade, by mechanism, can be lifted for any given time, exposing the light meanwhile. A flash of about half a second's duration is negative; a line of 1½ seconds, positive Four exhibitions of the light then represent a symbol as in Redl's cones. If the same nomenclature be adopted, we should signal as in fig. 5. It will be seen at once that this system produces results similar to Morse's Electric Telegraph. If the distance be within a mile or so, and the weather still, a bugle will answer equally well, long and short notes representing the positive and negative cones.

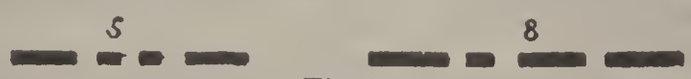


Fig. 5.

Heliography is now largely used for military signalling where there is plenty of sunshine. The heliograph is simply a mirror on a stand, capable of being swung horizontally as well as vertically, with a small hole in the mirror to look through, so as to direct it accurately, Two trained sappers with heliographs can easily flash signals to one another at a distance of 50 m., and so communicate even without the help of a telescope. See HELIOTROPE—HELIOSTAT—HELIOGRAPH.

AUTOMATIC RAILWAY-SIGNALS.—The system of automatic block-signalling has been extensively introduced on crowded sections of American railways. It involves the use of a pneumatic system for moving semaphores placed at the block limits. The action of the compressed air is regulated by valves operated by electricity. The rails of the road are used as conductors. A copper wire is carried across the adjoinings, and is secured by pins driven into the web of the rail. This insures good connection. At the end of each block the wire is omitted, and an insulating piece inserted between the rail-ends. The semaphores are fitted with counterpoise weights which tend to draw them into the danger position. An air-cylinder with piston is so connected to the semaphore as to move it into the safety position when air enters. The air is admitted to the cylinder through a valve actuated by a solenoid coil, the valve-stem acting as the core of the solenoid. When a current is passing, the valve is held open. Included in the system are an air-compressing station with pipes leading to the different semaphores, and line-batteries actuating relays.

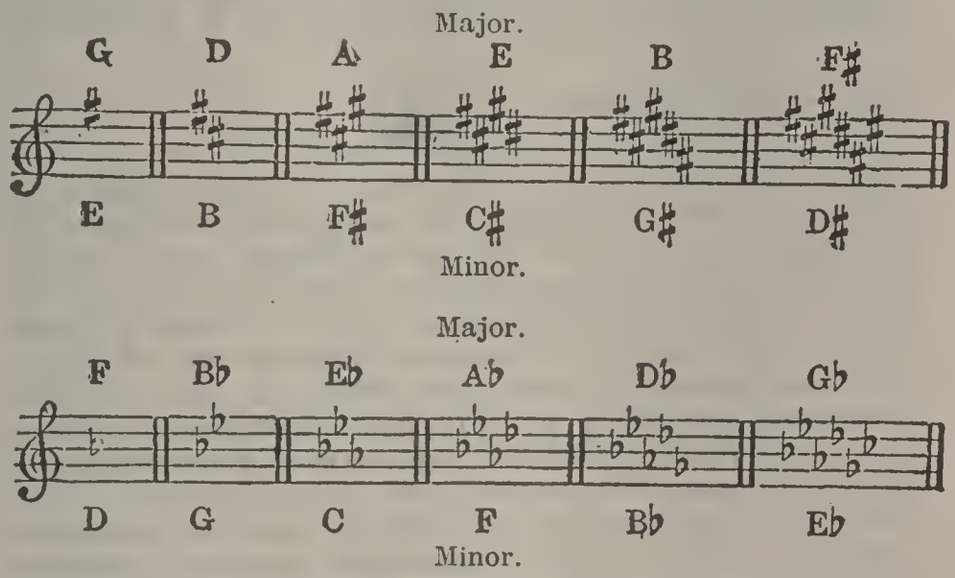
which control local batteries for operating the air-valves. As long as a block is unoccupied by a train, the electric current passes, holds the valve open, and the air-pressure maintains the semaphore in the safety position. When an engine comes upon the block it connects the two rails electrically and cuts off or 'short-circuits' the current so that none or very little goes to the semaphores. Consequently the valve closes, and at the same time an outlet is provided for the compressed air in the cylinder. At once the semaphore is raised by the counterpoise weight, and shows danger. The train as it leaves the block permits the current once more to act on the air-valve. It opens it and closes the escape. The air enters the cylinder and forces the semaphore into safety. It is usual to have two semaphores at the beginning of each block. One is actuated by a train on its own block, and indicates danger; the other is so connected as to be actuated by a train on its own and also on the next block, so that it indicates a train over a block removed, and is interpreted as caution. The general system has, as an important feature, the making any accident to the electric circuits or air-pipes set the signals at danger. The blocks for crowded roads may be very short.

SIGNAL SERVICE OF THE UNITED STATES: see METEOROLOGY: STORMS.

SIGNATORY, a. *sĭg'nă-tĕr-ĭ* [L. *signātor*, a witness to a will by signing it; *signārĕ*, to seal (see SIGN)]: relating to a seal, or signing a name: N. one who signs his name to a formal authoritative document, as to an international treaty.

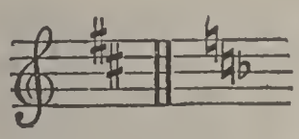
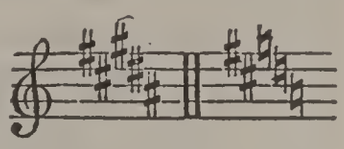
SIGNATURE, n. *sĭg'nă-tūr* [F. *signature*—from L. *signātus*, set a mark upon, sealed; *signārĕ*, to seal (see SIGN): It. *segnatura*]: name of a person written or subscribed by himself; a sign or mark impressed: in *music* (see below): in *printing* (see below).

SIGNATURE, in Music: sharps or flats placed after the clef to indicate the key of the piece. In writing music in any key with sharps or flats, the sharps and flats belonging to the key, instead of being prefixed to each note as required, are placed together immediately after the clef on the degrees of the staff to which they belong (see KEY). The signatures of the several keys generally in use are as follows:



The minor keys take the same S. with the major keys a third above them.

When a new key is introduced in the middle of a piece of music, the S. of the former key must be contradicted, and that of the new one appended. Thus a transition from the key of D major to that of D minor is indicated thus:


; from B major to B minor:

;

the sharps which are to continue being, in this last case, for distinctness' sake, appended in addition to the contradiction of those that are to be discarded. A transition to another key which is not to continue for any length of time is seldom indicated by a change of S.; but the sharp, flat, or natural sign is appended to any note as required, that sign affecting all the following notes of the same letter in the measure in which it occurs, unless contradicted: a sharp, flat; or natural thus introduced is called an accidental. Two accidentals are required in the ascending scale of every minor key, to sharpen the sixth and seventh of the tonic.

Besides the S. of the key, a S. of time precedes every musical composition: it consists of two figures placed over one another as a fraction, the denominator 2, 4, 8, or 16 standing for minims, crotchets, quavers, or semiquavers (i.e., halves, fourths, etc., of a semibreve), while the numerator points out how many of these fractional parts of

a semibreve are contained in each measure. Thus

indicates that there are two crotchets, and

three quavers, in the measure. When there are four crotchets (or a semibreve) in the measure, it is usual to

write instead of .

SIG'NATURE, in Printing: letters or figures placed at the bottom of the first page of each sheet of a book, to facilitate arrangement of the several sheets in the volume by indicating their number and order. The letters employed are those of the alphabet, except J, V, and W, three letters which have been invented since the use of signatures was introduced (see ALPHABET). As the first sheet of a work, containing the title-page, dedication, preface, etc., is generally printed last, the letter A is sometimes reserved (with small letters, *a*, *b*, etc., should there be more sheets of introductory matter) for this, and the signatures commence with B; after reaching Z, they begin again at the beginning of the alphabet, the letter being doubled for distinction, as AA, or A*a*, or more frequently 2A. Should the alphabet again be exhausted, 3A, 3B, etc., are next employed, and so on. This has been the method usual in Britain; in the United States, France, and Italy, figures are more common. Signatures are placed also on certain pages of the same sheet, as a further direction to the bookbinder. The use of signatures is not universal.

SIGNET, n. *sĭg'nĕt* [OF. *signet*, a signet, seal, stamp; F. *signe*, a sign or mark—from L. *signum*, a mark]: in England, the seal used by the sovereign to authenticate private letters and grants. Formerly all royal warrants had to pass through the Signet-office; since 1848 the royal sign manual, countersigned by one of the principal secretaries of state, suffices as authority for affixing the privy seal; and the Signet-office has been abolished. SIGNET-RING, finger-ring having a stone engraved with a crest or monogram. WRITERS TO THE SIGNET, usually contracted into W.S., in *Scotland*, a body of legal gentlemen who formerly had charge of the king's signet, with exclusive privilege of signing all summonses for citing parties to appear before the court of session, and other writs that pass the signet, conducting also general law business, and acting as agents in cases before the court of session—their functions and privileges have now been largely transferred to a body of 'law agents,' whose business corresponds nearly to that of attorneys and solicitors (see WRITER TO THE SIGNET).

SIGNIFICANT, a. *sĭg-nĭf'ĭ-kănt* [L. *significans* or *significan'tem,* showing, pointing out; *significare,* to show or point out—from *signum,* a mark, a sign; *facĭō,* I make: It. *significante,* significant]: expressing something beyond the external mark; expressing some fact or event; forcible to express the intended meaning; betokening; standing as a sign of something important; momentous: N. in *OE.,* that which expresses a meaning deeper than appears by the external sign; a token. SIGNIF'ICANTLY, ad. *-lĭ.* SIGNIF'ICANCE, n. *-kăns,* or SIGNIF'ICANCY, n. *-kăn-sĭ,* meaning; import; power of impressing the mind; importance; moment. SIGNIFICATION, n. *sĭg'nĭf-ĭ-kā'shŭn* [F.—L.]: act of making known by signs or words; meaning; sense; import. SIGNIF'ICATIVE, a. *-kă-tĭv,* having signification or meaning; strongly expressive of a certain idea or thing. SIGNIF'ICATIVELY, ad. *-lĭ.* SIGNIF'ICATIVENESS, n. *-nĕs,* the quality of being significative. SIGNIF'ICATORY, a. *-kā-tĕr-ĭ,* having meaning. SIGNIFY, v. *sĭg'nĭ-fī* [F. *signifier,* to signify—from L. *significārĕ*]: to have or contain a certain sense; to denote; to mean; to make known; to express or declare by a token; to have consequence. SIG'NIFYING, imp. SIG'NIFIED, pp. *-fīd.* IT SIGNIFIES NOTHING, or IT DOES NOT SIGNIFY, it is of no importance.—SYN. of 'signify': to express; imply; testify; intimate; involve; manifest; declare; utter; betoken; denote; mean; import; weigh.

SIGNING, SEALING, AND DELIVERY, of a Deed: formal, legal mode of executing a deed. In England, the main acts are sealing and delivery, for signature is not absolutely essential—at least in some kinds of deeds. In the United States, signing is commonly required by statutes; even when it is not so required, the signature is always added for greater security. The use of the seal is an ancient form of authenticating deeds, still kept up in the United States and England, though long superseded in Scotland by simple subscription. Delivery is the transfer of the deed from the grantor to the grantee or his agent; and it may be by acts alone, or by words alone: all that is essential is that there shall be intention to make delivery.

SIGN LANGUAGES: are of two kinds, the descriptive and the characteristic or indicative signs. Descriptive signs involve an account, more or less complete, of the appearance, qualities, and uses of an object, or the circumstances of an event, for the purpose of description or explanation; and must, from their nature, be varied, like a painting, only by the point of view from which the objects are described, or the capacity and accuracy of the person that describes. The indicative signs, on the contrary, which are employed in common conversation, are usually mere abbreviations of these, involving a single striking feature of the person, or object, or event; as an elephant is indicated by its trunk, a flower by its fragrance, or a town by a collection of roofs. The signs of

persons are usually conventional, and derived from some feature, or mark, or habit, but often from an accidental circumstance in dress, etc., which struck the deaf-mute on first seeing the person, and is still referred to when it no longer exists. This form of expression, as developed in certain institutions for deaf-mutes, is of a character which those who value it least admit to surpass speech in the force with which it communicates the feelings and states of mind. Like painting (as Condillac observes) it has the immense advantage of presenting a group of ideas at once, which lose much of their force and beauty by being detailed in the successive words and artificial arrangements of written language. The eye, the hand, the whole body, speak simultaneously on one subject; the representation changes every moment, and these peculiarities, with the elliptical form of expression which is adopted in conversation, give a rapidity to communication by the sign language which, on common subjects, among those familiar with it, surpasses that of speech. If we remark the new shades of meaning given to the same words by the varying attitude and general expression of the speaker, and the accuracy with which a nice observer will discover, in these signs, the thoughts, and feelings, and intentions, even of one who wishes to conceal them, we shall find reason to believe that they are capable of conveying the most delicate shades of thought. Generic and abstract terms, as their objects do not exist in nature, have no corresponding terms of equal clearness in the sign language; and the abbreviated manner in which we express relations by conjunctions, prepositions, relatives, and inflections, can only be imitated by adopting similar conventional signs, which do not easily fall in with the idiom of the language. In these respects, therefore, the sign language wants the algebraic brevity and accuracy which are found in artificial languages, and which render these so invaluable as mediums of thought and instruments of philosophical investigation; at the same time it is capable of describing what is conveyed by these forms, with an accuracy at least as great as that of words, by circumlocution and example. It is worthy of remark that the order of expression in the sign language is that which we term inverted—the subject before the quality, the object before the action, and, generally, the thing modified before the modifier. This language, in its elements, is to be found among all nations and has ever been the medium of communication between voyagers and the natives of newly discovered countries. It is employed by many savage tribes to supply the paucity of expression in their language, or to communicate with other tribes, as has been observed among the Indians of North America. Among the Indians of the western regions of the United States Major Long found it an organized language employed between tribes who spoke different articulate languages. His

account, as well as others given by subsequent inquirers, shows that it corresponds very closely with that adopted in the school of Paris; and a Hawaiian, who visited an American asylum for deaf-mutes, gave a narrative of his life in the sign language, which was perfectly understood by the pupils. As a proof that the sign language does possess a universal character in its cultivated form, a trustworthy authority, who himself acquired it in this form, has asserted that he employed it, or had seen it employed, with success, in communicating with an American Indian, a Hawaiian, a Chinese, and the deaf and dumb in various parts of the United States, in England, Scotland, France, Germany, Switzerland and Italy.

SIGNOR, n., or SIGNIOR, n. *sēn'yŏr*, SIGNORA, n. fem. *sēn-yōr'â:* in *Italy*, a title of respect. SIGNORY, or SIGNIORY, n. *sēn'yŏr-ĭ*, lordship; dominion; used by Shakespeare for *seniority*. See SEIGNIOR.

SIGNORELLI, *sēn-yo-rĕl'lē*, LUCA (full name LUCA D'EGIDIO DI VENTURA; called also LUCA DA CORTONA): about 1442-1524; b. Cortona: great Italian painter; forerunner by a few years of the supreme princes of Christian art, himself of the Tuscan and Umbrian school. He was apprenticed to Piero della Francesca; was painting at Arezzo 1472, at Citta di Castello 1474; may have been in Rome 1478-84, when he returned to Cortona, where he was a prominent magistrate as early as 1488 and at his death there, though he made professional tours from 1497 on. He was commissioned by Pope Sixtus to paint some frescoes, now obscured, in the shrine of Loretto, the subjects being from New Testament history. In the Sistine Chapel, Rome, the *Acts of Moses* is from his hand; in the convent of Chiusuri at Siena, 8 frescoes of the life of St. Benedict; in the palace of Pandolpho Petrucci, mythological subjects. But his greatest works are in the chapel of St. Brizio at Orvieto.

SIGNUM, n. *sĭg'nŭm* [L. a sign]: in *law*, a cross prefixed as a sign of assent and approbation to a charter or deed.

SIGOURNEY, *sĭg'ėr-nĭ*, LYDIA (HUNTLEY): author and poet: 1791, Sept. 1—1865, June 10; b. Norwich, Conn.; daughter of a soldier of the revolution. She was well educated, and, like most young ladies of ability in New England at that period, early engaged in teaching, in Hartford. In 1819 she was married to Charles Sigourney, merchant in Hartford. Her poetry, though not ranking with productions of the highest class, was a graceful and pleasing transcript of her own beautiful character. She was noted for philanthropy, which she was accustomed to carry to the point of self-denial in the aid of the needy. In 1822 she published a descriptive poem on the *Traits of the Aborigines of America;* and 1824, *Sketch of Connecticut Forty Years Since.* These were followed by *Pocahontas and other Poems, Lays of the Heart, Tales*

in Prose and Verse, etc. In 1840 Mrs. Sigourney visited Europe, and on her return wrote *Pleasant Memories of Pleasant Lands*. Forty-six books are ascribed to her pen. She compiled amusing and instructive works for the young, and was a constant contributor to magazines and other periodicals of poems and prose articles (to nearly 300 periodicals more than 2,000 articles), whose subjects, style, and sentiment gave her the designation 'the American Hemans.' Some of her books were widely read in England. She died at Hartford.

SIGSBEE, CHARLES DWIGHT: naval officer: b. Albany, N. Y., 1845, Jan. 16; graduated at Naval Academy 1863; served in West Gulf Squadron 1863-64; promoted lieutenant-commander 1868; commodore 1882; with coast survey 1874-78; sounded and explored Gulf of Mexico. He devised new methods in deep sea exploration for which he received the order of the Red Eagle of Prussia from Emperor William. He was promoted captain 1897; commanded the battleship Maine; and later the cruiser St. Paul in operations against Spain; captured Cervera's coal ship; commanded the battleship Texas 1898-1900; made chief officer of naval intelligence; rear admiral 1903. He retired 1907, Jan. 16. Author of *Deep Sea Sounding*, and *Personal Narrative of the Battleship Maine*.

SIGURD, *zē'goord*, or SIGURDE: a name famous in Scandinavian mythology. According to the legend Sigurd, the Siegfried of the Nibelungenlied, is the posthumous son of Sigmund, son of Volsung, a descendant of Odin; is born in the palace of Hialprek, king of Denmark, and grows up into splendid manhood. With his good sword Gram, which had once been wielded by Odin, he slays the dragon Fafnir, and obtains the golden treasure which it guarded; by eating the monster's heart he is endowed with a wisdom which enables him to understand the songs of the birds. Riding off with his spoil he strikes through a lonely heath, in the midst of which is a volume of flame, surrounding a house in which a fair maiden Brenhyldr (Brunhild in the Nibelungenlied), daughter of Atli, lay asleep, never to be wakened until there came a hero brave enough to ride through the fierce flame. Sigurd enters and wakes up Brenhyldr, to whom he plights his troth, and then rides to the palace of Giuki the Niblung, who wishes Sigurd to marry his daughter Gudrun (Chriemhild). Gudrun's mother gives Sigurd a potion which causes him to forget Brenhyldr, and he marries Gudrun. Her brother Gunnar (Gunther), having determined to marry Brenhyldr, tries vainly to ride through the flames, and so his mother by her magic arts made Sigurd change shapes and arms with Gunnar, and so rescue Brenhyldr. On the bridal bed Sigurd places his sword between himself and Brenhyldr, and the following morning he resumes his shape, and hands her over to Gunnar. No sooner is this done than the power of the

elixir passes off, and he sees when too late that he has betrayed his first love. After the lapse of years Brenhyldr is told that she was rescued from the flames by Sigurd, and not by Gunnar as she thought; and her love for the hero gives way to wrath and thoughts of vengeance. She urges Gunnar and his brothers to slay him, but as they had already taken an oath not to hurt him, they refuse. They, however, incite their half-brother to do the deed, and Sigurd is killed as he lay sleeping. The death of the hero revives all the love of Brenhyldr, and lying down by his side with the sword Gram between them, she dies broken-hearted on his funeral pile.

SIKA: the common deer of Japan (*Cervus sika*), representing a group (subgenus *Sika*), whose peculiarity is that the antlers have no bez-tine, so that each has usually only four points; the tail is long proportionately, and the ischial white patch is bordered with black. The Japanese deer, abundant in the forests of northern Japan and China, is of small size, dark brown in color and the greater part of the tail white; but in summer the coat is spotted with white. This, and the similar Formosan and Manchurian deer, are often caught in traps and kept as pets by the people; and are capable of thriving in European parks. A closely related form is the Caspian deer (*C. caspicus*) of northern Persia.

SIKHIM, or SIKKIM: India; a native state under British protection, situated in the eastern Himalayas between Nepal and Bhutan, and between Tibet and the province of Bengal. Area, 2,818 sq.m. It forms part of the south slope of the Himalayas and ranges in altitude from 18,000 feet in the n. to 1,000 feet in the s. The climate is accordingly varied, ranging from tropical to alpine. Formerly most of the area was covered with forest, but the greater part below 5,000 feet has in recent years been cleared and cultivated. The chief products are maize and rice. The mountain roads are good, and the route of British trade with central Tibet passes through the state. The inhabitants are Buddhists of Tibetan stock, and governed by a raja, the capital being Tumlung. The country was formerly controlled by Tibet, but came under British protection by a treaty with China in 1890. Pop. (1901) 59,242.

SIKHS, *sēks:* the name of a religious sect in British India which has come in course of time to be virtually also the designation of a race or people. Nanak Shah was the founder of the sect, which worships only one omnipotent and invisible God, and whose tenets reflect the broadest religious philanthropy and toleration. Nanak Shah belonged to the Hindu tribe of the Vedis, and was born in 1469 in the village of Talwandi, now the town of Rajapur, in the province of Lahore. Nanak was a profound thinker, and far in advance of the views which prevailed in his day in any part of the world in relation

to liberty of conscience and human brotherhood. His impressions in this regard were largely derived from the works of a Mohammedan named Kabik with which he became acquainted in his travels. He sought to introduce simplicity of faith and purity of morals, and to induce Hindus and Mohammedans to live in harmony. He died about 1540, and was buried at Kirtipur, which is therefore a place of pilgrimage for the Sikhs. He well deserved the honor in which his memory is held. His life was pure, he absolutely denied any power to perform miracles, and he taught his disciples to worship God alone. Although peace between men was an essential part of the Sikh religion, the horrible persecutions to which they were subjected by the Mohammedans forced the Sikhs to become a military people, and under their great leader, Govind Sinh, they fought so bravely and successfully as to receive the title of Sihns or lions. They wore a blue dress, let their hair grow, and were always armed. Govind Sinh also instituted the order of 'akalis' or 'immortals,' in whom to this day rests the supreme direction of religious affairs among the Sikhs. The struggle between Sikhs and Mohammedans, and between independent communities of Sikhs continued, until Runjeet Singh, the son of Maha-Singh, succeeded in establishing himself as despotic ruler of the Sikhs, about the close of the 18th c., and made himself master of a territory comprehending the whole Punjab and adjoining districts, with an area of 69,000 sq.m. After the death of Runjeet Singh, and while his son, Dhulip Singh, a minor, was the nominal ruler, war broke out between the British and the Sikhs, in 1845. The struggle lasted with varying fortune, and intervals of temporary submission on the part of the Sikhs, until the decisive battle of 1849, Feb. 21, when the Sikh power was completely broken, their territory being annexed in the following month to the British empire in India. The Sikhs have since proven faithful friends of the British, and never wavered from their allegiance at the time of the great Mutiny. They are among the best of the British Indian troops. See also INDIA.

SIKINO, *sē'kē-nō* or *sē-kē'nō* (ancient, SIKINOS), Greece: an island e. of Melos, belonging to the Cyclades. It is 10 m. long by 3 m. wide. It has a rugged mountainous surface, but the soil is fertile. Wine is the staple. Its chief town is situated on the brow of a lofty precipice. In ancient times the island belonged to Athens, and in the Middle Ages to the duchy of Naxos.

SIKSIKA, *sĭk'sĭ-kâ* ('Blackfeet': by which name they are popularly and officially known): an important tribe and confederacy of the Algonquian stock of North American Indians, the confederacy comprising the Siksika proper, the Kino or Bloods, and the Piegan. They should not be confounded with the Blackfoot division of the Teton Sioux on Standing Rock reservation, N. D. The

early Siksika home was the country n. of Lesser Slave Lake, but in the middle of the 18th c. they appear to have lived on the w. side of Lake Winnipeg, whence they were forced westward by the Crees; 40 years later the Siksika proper occupied southern Saskatchewan river, while the Piegan lived on its headwaters, after which time the latter, followed by the Siksika, moved down to the Missouri river. Early in the 19th c. the home of the Siksika was northern Montana and the adjacent part of British America, extending from the Rockies to the junction of Milk river with the Missouri, and from Musselshell river in Montana to Saskatchewan river in Canada. The component tribes of the confederacy are now gathered on reservations within these limits, the Siksika and the Kino or Bloods being mainly under Canadian rule, while the Piegan, who constitute about half the confederacy, are chiefly in Montana. Both the men and women are tall and well formed; they practised polygamy, and on the death of the husband his wives became the potential wives of his eldest brother, while his property descended to his sons, or, if he had none, to his brothers. These Indians were always noted for their warlike character, their hostilities being conducted chiefly against the Cree, Crows, Shoshoni, Kutenai, and Flatheads. They relied mainly on the buffalo for subsistence, their food, clothing, shelter, and some of their implements and utensils being derived from this useful animal. They lived in skin tipis, and besides bags and cases of hide or parflèche, made implements and utensils of stone, bone, horn, and wood, but no pottery or basketry. Marriage within the gens was prohibited, but this rule is not now strictly observed. Each gens had its chief, and the chiefs of the gentes chose the tribal chief, but the power of the latter was in the main only advisory. The Siksika are nature worshippers, their principal deity being the sun, whose wife is the moon, and whose surviving child is the morning star, while physical objects and forces are minor deities. In the latter part of the 18th c. these tribes were estimated at 12,000, but they lost about a third of their number by smallpox in 1836, and in 1858 aggregated only about 7,300.

SI'LAGE, or ENSILAGE: green fodder preserved in a succulent state by exclusion of air, where it undergoes certain changes. In the United States Indian corn (*Zea mays*) is pre-eminently the crop for silage, so when other crops are utilized a designatory adjective is prefixed, as clover-silage, etc. Silage may be stored in silos, or air-tight structures, made of wood, brick, stone, concrete or iron, and either circular, square, octagonal or rectangular in section, the round wooden silo being the most common, because lumber has been the cheapest material and a cylindrical vessel requires the use of less material, contains less waste space, and presents the greatest strength, pressure being distributed equally at all points from the

center. When placed in silos, the fodder is usually cut or shredded into short lengths so that it will occupy less space, incorporate less air and undergo less fermentation. In Europe grass is frequently stacked in the open or put into clamps or pits without cutting it into lengths. The use of the silo in one form or another dates back to antiquity, the clamp being probably the oldest form. About a hundred years ago, this method of preserving fodders attracted attention in Europe, and in 1875 Dr. Manly Miles of Michigan, and in 1876 F. Morris of Maryland, introduced the system into the United States. Many extravagant claims were advanced in its behalf by early enthusiasts, and lack of knowledge led to many failures, so that the progress made was small for some years. In 1882 but 92 farmers could be found who used the silo in the United States. The work of Professors McBryde and King, of the Wisconsin and other agricultural experiment stations, made the position of the silo and silage secure.

The size of the silo is important, serious losses occurring from lack of proportion between the size of the silo and the amount of silage fed daily. The exposed surface is usually too great. The upper layer, if exposed, spoils; hence about 1.2 inches should be fed each day from the whole surface and 2 inches would be better. A cow will consume 35 to 40 pounds per day, and if a cubic foot weighs 40 pounds, we may allow 5 to 6 square feet by 2 inches thick per cow per day. Silos less than six feet in diameter are not considered to be practical on account of the friction of the walls preventing the contents from settling properly, and the greater surface in proportion to bulk means greater percentage of loss. Deep silos are preferable to shallow ones, as a 36-foot silo will store nearly five times the amount that a 12-foot one will, the diameters being equal. King calculates that the average weight of a cubic foot of silage from a silo 10 feet deep is 18.7 pounds, while the average from one 36 feet deep is 42.8 pounds. All silos should be at least 20 feet deep, and 30 feet is better. The pressure of the silage when settling increases with the depth at the rate of 11 pounds per square foot for each foot of depth, hence, at 10 feet down the lateral pressure is about 110 pounds per square foot; at 20 feet, 220 pounds, and at 30 feet, 330 pounds; therefore, the hoops should be larger, stronger, and closer at the bottom of the silo than at the top, the first one starting six inches from the bottom, the second a foot above the first, increasing the space six inches with each hoop until near the top they are finally four feet apart.

The crops used for silage include corn, millet, common red and alsike clover, rye, oats, pea-vine, sorghum and alfalfa. The making of silage from several of these crops is in a more or less experimental stage. The low cost and ease with which heavy crops of corn can be produced; the slight losses sustained in the silo (2 to 10 per

cent), and the few objectionable features that corn silage has, render it the general purpose crop. The percentage of losses which occurs in drying corn fodder in the field under good conditions is about the same as that attending its loss when converted into silage. The cost of growing and placing a ton of silage in the silo generally varies between $1.75 and $2.50. The southern dent varieties produce the heaviest crops, and, if they mature sufficiently in the district, are generally grown. The best time to cut corn for silage is when the kernels are mature, but the stalks, leaves and husks green, as under these conditions less fermentation and other losses occur. Millet has been tried to a small extent. Clover makes good silage, but the unavoidable losses are higher than with corn. This crop should be cut when the bloom has begun to turn brown. Rye and oats, owing to their hollow stems which carry considerable air, are subject to serious loss in weight when made into silage. Pea-vine silage is a by-product of canning factories. Alfalfa silage is still in the experimental stage. Grass is used for silage in the United Kingdom.

THE AVERAGE PERCENTAGE COMPOSITION OF SILAGE (HENRY).

	Water	Ash	Protein	Crude fibre	Nitrogen free extract	Ether extract
Corn	79.1	1.4	1.7	6.0	11.0	0.8
Red Clover	72.0	2.6	4.2	8.4	11.6	1.2

THE AVERAGE DIGESTIBILITY OF SILAGE (HENRY).

	Dry matter	Protein	Crude fibre	Nitrogen free extract	Ether extract
Dent corn, grain milk stage to mature	64	52	62	69	85
Flint corn, ears glazing	75	65	77	79	82

When corn is nearly mature before being siloed it will contain from 50 per cent to 100 per cent more dry matter and nutrients than these figures show, be more palatable and probably more digestible. The digestibility of corn silage and dry fodder corn are about the same, both being somewhat less digestible than green fodder.

Silage is pre-eminently a food for the cow and its use will largely remain with the dairy farmer. Feeding trials with dairy cows show that silage usually gives better results than a corresponding amount of dry fodder. It has been ascertained that the use of silage produces from 4 to 5 per cent more milk and fat per 100 pounds of dry matter fed, due to the silage being more acceptable, and the stalks of corn being cut up in the silage and eaten, instead of rejected as when fed in the form of corn fodder. In feeding great care must be exercised not to leave unconsumed and putrifying silage about the stables

as the odor may taint the milk. Several milk-condensing factories refuse the milk from silage-fed cows. Experts may detect a silage odor or flavor in milk from silage-fed cows, but this is of little import, as such milk, and butter made from it, are now sold to critical customers.

SILAO: Mexico; a town in the state of Guanajuato, situated on the Mexican Central railroad, 15 m. s.w. of Guanajuato. It is the center of a rich agricultural district, and manufactures cotton and woolen goods. Pop. 15,437.

SILAY: Philippines; pueblo of Negros Occidental, on Guimarás Strait, 10 m. n. of Bacolod. It is a large and prosperous town open to coasting trade, and is a telegraph and military station. Pop. 14,537.

SILCHESTER: England; a village in Hampshire, 7 m. n. of Basingstoke, of special archæological interest. Here are the ruins of Caer Segeint, or Calleva Atrebatum, a Roman town, the main features of which are an amphitheatre, and the city walls, 2,760 yards long. The foundations of a basilica, forum, baths, and a temple, have also been excavated, and rings, coins, seals, broken pottery in abundance have been found near the surface.

SILE, v. *sĭl* [Sw. *sila,* to strain, to filter: Low Ger. *silen,* to drain off water]: in *OE.,* to ooze through; to drip; to sink down. SIL'ING, imp. SILED, pp. *sĭld.* SILT, n. *sĭlt,* the sediment, ooze, or mud which settles from river or sea water in a river-mouth or estuary.

SILENCE, n. *sī'lĕns* [F. *silence*—from L. *silentĭum,* stillness, silence; *silens* or *silen'tem,* still, silent—from *silērĕ,* to be silent: It. *silente,* silent]: entire absence of sound or noise; temporary cessation of speech in man; stillness; muteness; quiet; habitual taciturnity; secrecy; oblivion; obscurity: V. to restrain from noise or speaking; to still; to appease; to stop; to put an end to; to cause to cease firing, as to *silence* a battery: IMPERA. or INT. let there be no speech or noise; hush. SI'LENCING, imp. SI'LENCED, pp. *-lĕnst.* SI'LENT, a. *-lĕnt,* quiet; still; habitually speaking little; not mentioning; not acting; having no sound, as a letter; in *OE.,* wanting efficacy. SI'LENTLY, ad. *-lĭ,* without speech; without noise.—SYN. of 'silent': dumb; mute; speechless; voiceless; noiseless; taciturn; quiet; still.

SILENE, *sī-lē'nē:* genus of plants of nat. order *Caryophyllaceæ;* without a tubular 5-toothed calyx; five notched or bifid petals, which terminate in a narrow claw at the base, spring from the stalk of the germen, and have each an appendage forming a *Corona* in the mouth of the corolla; ten stamens; three styles; the capsule 3-celled, 6-toothed, many-seeded. The species are numerous, natives mostly of temperate parts of the northern hemisphere, annual and perennial plants; some of them frequent in flower-gardens. Our wild species have common names translated from their botanic, such as Pennsyl-

vanian (or Wild Pink), Virginian (or Fire Pink), Royal Catchfly, Starry Campion, etc. Introduced species are the Night-flowering C., Sweet-William C., and Sleepy C. The BLADDER CAMPION (*S. inflata*), perennial, another species naturalized from Europe, growing wild in fields of the eastern states, has a branched stem fully 12 inches high, ovate-lanceolate bluish-green leaves, panicles of white flowers, and an inflated calyx, with a beautiful network of veins. The young shoots are sometimes used like asparagus, and have a peculiar but agreeable flavor, somewhat resembling that of peas: they are best when most blanched.—The MOSS CAMPION (*S. acaulis*) is a pretty little plant, with beautiful purple flowers growing in patches so as to form a kind of turf, one of the finest ornaments of higher mountains in Scotland.—Many species are popularly called CATCHFLY, from their viscidity, detaining small insects that light on them.

SILENUS, *sī-lē'nŭs*, in Anc. Mythology: a satyr, son of Pan and Gæa (the Earth); generally represented as chief of the Sileni or older Satyrs (q.v.), and the inseparable companion of Bacchus, with whom he took part in the contest against the Gigantes, slaying Enceladus. In most respects he seems to have resembled the other satyrs, being in addition noted for wisdom and power of prophecy. S. had a temple at Elis.

SILERY, n. *sĭl'ĕr-ĭ* [etym. doubt.]: in *arch.*, foliage carved on the tops of pillars.

SILESIA, n. *sī-lē'shĭ-a*: kind of thin, coarse linen cloth, named from the place of its original manufacture; a cotton material, usually twilled, used for dress-linings.

SILESIA, *sĭ-lē'shĭ-a:* province of the kingdom of Prussia, included in the German empire; s. of the provinces of Brandenburg and Posen: bounded e. by the Polish provinces of Russia and Austria, s. and w. by the Austrian provinces of Silesia and Bohemia and the kingdom of Saxony. It is divided into three govts: *Liegnitz*, in the w.; *Breslau*, in the e.; *Oppeln*, in the s.; and these are subdivided into circles: 15,666 Eng. sq. m. Pop. (1871) 3,707,144, of whom 1,896,136 were Rom. Catholics, 1,760,-341 Protestants, 46,629 Jews; (1900) 4,668,857. Of the pop., one-fifth speak Polish, more than 90,000 employ other Slavic dialects, and the rest use the German language. This province, largest and much the most populous of the Prussian provinces, is crossed from n.e. to s.w. by a broad strip of mountainous country, which widens out at each extremity; and along the whole e. boundary, and in the s., are ranges of low hills; in the n.w. and centre, the surface is flat and heathy, or sandy, with numerous stagnant pools. S. is almost wholly included in the basin of the Oder (navigable as far s. as Ratibor), which flows through it from s.e. to n.w., and receives from each side numerous tributaries; but a small portion in the extreme s. is drained into the Vistula, which here takes its rise. The soil is altogether fertile and well cultivated, more so, however, in Lower than in Upper S.; and cereals of all kinds, oil-

plants, beets, hops, occasionally vines, and, above all, flax and hemp, are the crops of the province; but of late years the cultivation of tobacco, and of plants yielding dyestuffs, has increased. Cattle and sheep, the latter excellent in quality and partly of pure or mixed merino blood, are reared in the highlands, the annual produce of wool averaging fully 140,000 cwt. The mines of S. are of great importance; iron, copper, and lead are chief products; coal is found in abundance. The manufacture of lace, averaging in annual value $7,500,000, is carried on in the mountainous districts, chiefly around Schweidnitz; and the production of other fabrics, e.g., linen, cotton and woolen goods, paper, iron, leather, glass, and earthenware, is vigorously carried on throughout the province. The Oder, and the great central railway from Berlin and Posen to Vienna, afford ample facilities for commerce. There are a univ. at Breslau, gymnasia in the principal towns, and a great number of professional and industrial schools.

S. was inhabited at the beginning of the Christian era by the Quadi and Lygii, who, like the other German tribes, advancing w. in the 6th c., were succeeded by Slavic tribes. It formed part of the Slavic kingdom of Moravia, was next joined to Bohemia, and in the beginning of the 10th c. to Poland. In 1163 it was separated from the kingdom of Poland, but was ruled by dukes of the royal line of Piast; these dukes, to repeople the country devastated by the numerous civil wars, encouraged the settlement of German colonies, especially in Lower S. The practice of division and subdivision of territory prevailed so extensively that at one time S. had no less than 17 independent dukes; and to save itself from reincorporation with Poland, it acknowledged the sovereignty of the kings of Bohemia, with which, and with Germany, from the time of Emperor Karl IV., it was indissolubly connected. In 1537 the Duke of Liegnitz, one of the numerous Silesian princes, entered into an agreement of mutual succession (*Erbverbrüderung*) with the Elector of Brandenburg, on the extinction of either reigning line; and the other ducal lines becoming gradually extinct, their possessions fell to Liegnitz or to Bohemia, or lapsed to the emperor. In 1675, when the last ducal family, that of Liegnitz, failed, its territories of Liegnitz, Brieg, and Wohlau, would have fallen to Prussia, but the emperor of Germany refused to recognize the validity of the agreement of 1537, and took possession of the Liegnitz dominions, as a lapsed fief of Bohemia. The remainder of S. was thus incorporated into the Austrian empire. In 1740 Frederick II. of Prussia, taking advantage of the helpless condition of Maria Theresa of Austria, laid claim, on the strength of the agreement of 1537, to certain portions of S.; and without declaring war, marched into and took possession of the province, maintaining his hold despite the utmost efforts of Austria 1740–42 and 1744–5, called the *first* and *second* Silesian wars. After the *third* Silesian war, better known as the SEVEN YEARS' WAR (q.v.), S. was finally ceded (1763) to Prussia.

SILE'SIA, AUSTRIAN: duchy and crownland of the Austrian empire, bounded n.e. by Prussia, s.w. by Moravia: 1,980 sq. m. It is mountainous in the w., where the Spieglitzer Schneeberge, a summit of the Sudetic chain, rises 4,512 ft. The crownland comprises 1,806 sq. m. of level land, of which by far the greater portion is arable or in forest. The climate, though rough, is healthful; and the soil produces good crops of rye, oats, barley, flax, etc. Within the crownland rise the rivers Oder and Vistula. Cattle-breeding and bee-keeping are important industries; 110,000 head of sheep belong to the crownland. Iron, lead, and coal mining are profitably pursued. The manufactures are principally spirits, copper and iron wares and linen and cotton fabrics. Pop. (1890) 602,117; (1900) 680,422.

SILESIAN, a. *sī-lē'shan* or *-shĭ-an:* of or belonging to *Silesia*, a district of Prussia: N. a native or inhabitant of *Silesia*.

SILEX, n. *sī'lĕks*, or SILICA, n. *sĭl'ĭ-kă* [L. *silex* or *silĭcem*, a pebble-stone, flint: F. *silex:* It. *silice*]: in *chem.*, flint; the oxide of the metal silicon; a mineral existing in the forms of flint, etc.; sometimes generically applied to any mineral in which silica is the principal constituent (see QUARTZ). SIL'ICATE, n. *-kāt*, a salt of silicic acid. SIL'ICATED, a. combined or impregnated with silica. SILICEOUS, a., or SILICIOUS, a. *sĭ-lĭsh'ŭs*, resembling or containing silex; flinty. SILICEOUS SINTER, an incrustation or deposit from springs holding silica in solution. SILICIC, a. *sĭ-lĭs'ĭk* of or pertaining to, or obtained from, flint or quartz. SILICIC ACID, a name applied to *silica*, or a compound of silicon and oxygen, having certain of the properties of an acid. SILICI-CALCAREOUS, a. *sĭ-lĭs'ĭ-kăl-kā'rĕ-ŭs*, consisting of silica and calcareous matter; cherty. SILICIFEROUS, a. *sĭl'ĭ-sĭf'ĕr-ŭs* [L. *fero*, I bear]: producing silex or flint. SILICIFY, v. *sĭ-lĭs'ĭ-fī* [L. *facĭō*, I make]: to render siliceous; to petrify by silex; to become flinty. SILIC'IFYING, imp. SILIC'IFIED, pp. *-fīd:* ADJ. converted into flinty or siliceous matter. SILIC'IFICA'TION, n. *-fĭ-kā'shŭn*. the conversion of any substance into stone by siliceous matter, a common process in the neighborhood of hot springs holding silica in solution. SILICIUM, n. *sĭ-lĭsh'ĭ-ŭm*, more usually SILICON, n. *sĭl'ĭ-kon*, the base of silica, an elementary substance of a dark nut-brown color: see SILICON, below.

SILHOUETTE, n. *sĭl'ū-ĕt'* [Fr., a meagre portrait, in allusion to Étienne de *Silhouette*, very economical French minister of finance]: profile or shadow-outline of the human figure or other object, filled in of a black or dark color, the shadows and extreme depths being sometimes indicated by the heightening effect of gum or other shining material. This species of design was known among the ancients, and was by them carried to high perfection, as the monochromes on Etruscan vases amply testify; but the name S. dates from about the middle of the 18th c., being taken from Étienne de Silhouette, French minister of finance 1759, who, to replenish the treasury, exhausted by the costly wars with Britain and Prussia and by exces-

sive prodigalities, instituted numerous reforms and practiced the strictest economy of expenditure. His extreme parsimony in all finance matters made him a subject for caricature; so that any mode or fashion that was plain and cheap—'surtouts' without plaits, trousers without pockets—was styled *à la Silhouette;* and profiles made by tracing the shadow projected by the light of a candle on a sheet of white paper being then much in vogue, have continued to bear the name. Although without merit as a work of art, the silhouette presents a clear and well-marked profile, and such instruments as the Pantograph (q.v.), etc., were frequently employed to obtain profiles of a reduced size direct from the human features.—Profiles cut out of black paper with scissors also receive the name silhouettes.

SILICA, SILICATE, SILICIC, SILICIUM. See SILEX; SILICON.

SILICLE, n. *sĭl'ĭ-kl,* or SILICULA, n. *sĭ-lĭk'ū-lă* [L. *silic'ŭla,* a little pod—from *sil'ĭqua,* a pod or husk]: in *bot.,* a short pod formed like a Silique (q.v.), but about as broad as long, or broader, occurring in many *Crucif'ĕræ.* SILIC'ULOSE, a. *-lōs,* or SILIC'ULOUS, a. *-lŭs,* bearing silicles; husky.

SIL'ICON: in Chemistry, one of the non-metallic elements, symbol Si, atomic weight 28.4. Next to oxygen it is the most abundant element found in the earth. It does not occur in nature in the free state but in combination with oxygen (silica) and with oxygen and various metallic elements as potassium, sodium, aluminum, calcium, etc., in the form of silicates. Silicon may be prepared by heating a mixture of metallic sodium and the double flouride of sodium and silicon ($Na_2SiF_6+Na_4=6NaF+Si$); also by action of heat on a mixture of magnesium and silica (sand). It exists in three allotropic forms, an amorphous brown powder, a graphitoidal, and a crystalline variety. The amorphous form is insoluble in all acids except hydrofluoric; it dissolves in potassium hydroxide to form a silicate; and burns in the air at high temperatures to SiO_2. The crystalline variety is very hard, is but little if at all attacked by hydrofluoric acid or potassium hydroxide, and cannot be burned. Silicon forms compounds with oxygen, sulphur, chlorine and some others, but the most important are the oxide SiO_2 and the salts derived from the various silicic acids.

Silica SiO_2, oxide of silicon, occurs very abundantly in nature both in crystalline and amorphous forms. Quartz, a very pure form of silica, crystallizes in six sided prisms terminated by six sided pyramids. The finer crystals of quartz are called rock crystal, while the imperfectly crystalline variety is known as quartzite. Of the amorphous forms we have opal, agate, amethyst, flint, sand, etc. Silica can be obtained in a fine state by melting sand or a silicate with sodium carbonate whereby a sili-

cate of sodium is formed. This is dissolved in water and hydrochloric acid added. Silicic acid separates in a gelatinous condition. The whole is evaporated to dryness, heated for a time a little above the boiling point of water, and then washed with dilute hydrochloric acid. The silica is left behind as a gritty white powder insoluble in water and in most acids. Hydrofluoric acid dissolves in, however, with the formation of silicon tetrafluoride (SiF_4). It also dissolves in alkalies to form silicates. Not acted on by heat except that of the oxyhydrogen blow pipe, which fuses it. Silica, generally in the form of sand, is used largely in the preparation of mortar, glass, and pottery. In metallurgical operations it is used as a flux with ores containing limestone, with which it forms a glassy slag which floats on the molten metal carrying with it many impurities from the ore. Silica forms a number of hydrates which have acid properties and from which a vast number of salts are derived. A great many very complex salts of these silicic acids are found in the earth's crust, the metallic elements being usually sodium, potassium, magnesium, aluminum, calcium and frequently small amounts of other elements. Some of the best known silicates are the minerals feldspar, mica, garnet, talc, meerschaum, etc. Clay is largely a silicate.

SILIQUA, n. *sĭl'ĭ-kwâ:* a weight of four grains used in weighing gold and precious stones; a carat.

SILIQUE, n. *sĭl'ĭk,* or SILIQUA, n. *sĭl'ĭ-kwâ* [F. *silique* —from L. *sil'ĭqua,* a pod or husk]: in botany, the fruit of the *Cruciferæ,* a capsule opening by two valves, which, when ripe, separate from the base upward, leaving a central frame (*replum*), to which the seeds remain attached, and which is regarded as formed by parietal placentas, the valves giving way close to the suture. It is the pod-like fruit of the *Cruciferæ;* as in the cabbage, turnip, and wall-flower seed-pods. The seeds are either in one row or in two. A SILICULE (*silicula*) or SILICLE (q.v.) is merely a silique of different form, the true silique being long and narrow, the silicule broad and short, though Linnæus made this difference the foundation of the orders (*Siliquosa* and *Siliculosa*) of his class *Tetradynamia,* a distinction not now equally attended to in the subdivision of the nat. order *Cruciferæ.* SIL'IQUOSE, a. *-ĭ-kwōs,* or SIL'IQUOUS, a. *-kwŭs,* bearing siliques. SILIQUIFORM, a. *sĭl-ĭk'wĭ-fawrm* [L. *forma,* shape]: shaped like a silique.

SIL'IUS, TITUS CATIUS, ITALICUS: Roman poet: flourished about 25-101 A.D. At Rome he applied himself to the bar, and became a celebrated orator and advocate. He was consul at the time of Nero's death, and incurred some reproach for assisting in that tyrant's prosecutions, but acquired honor from his conduct in the proconsulate of Asia, assigned to him by Vespasian, from which he retired into private life, and collected books, statues, and

busts of eminent men. He finally retired to his seat in Campania, where he died. The only work of Silius which has reached modern times is an epic *Punica* in 16 books, written with more diligence than genius.

SILISTRIA, *sĭ-lĭs'trĭ-a:* town of the new principality of Bulgaria; on the right bank of the Danube, which is here nearly one-fourth of a mile wide and studded with numerous islands. The houses are mean, and generally of wood, though sometimes of stone, also of mud; the streets, like those of most Moslem cities, are crooked, narrow, dirty, and ill-paved; and the manufactures are insignificant though there is considerable trade in wood and cattle. The Dobrudscha, ceded by Turkey to Roumania 1878, is bounded by a line running from a point just e. of Silistria to Mangalia on the coast. The importance of Silistria lay formerly in its value as a military outpost of Turkey. Its walls were of solid masonry; but consisted merely of a fortified *Enceinte* surrounded by a ditch, the great strength of the fortress depending on the support given to it by detached works. Silistria is a town of great antiquity, and was a fortress under the Byzantines. Here, 971, the Byzantine emperor, John Zimisces, routed the Russians under Sviatoslav. It has been repeatedly assaulted and taken by the Russians. In 1849 Silistria was made a stronghold of the first class, and was rendered almost impregnable by the addition (1853) of 12 detached forts on the s. and e. On the outbreak of the Crimean war, the Russians laid siege to it, with an army of 60,000 to 80,000 men, but were compelled to retreat after 39 days. The Congress of Berlin, 1878, when erecting Bulgaria into a principality, decreed that the fortifications of Silistria, like those of the other Bulgarian cities, should be dismantled. Pop. 11,414.

SILK, n. *sĭlk* [AS. *seolc;* Dan. *silke,* silk—from L. *sērĭcum,* by a usual substitution of *l* for *r,* the produce of the Seres or Chinese: Gr. *Sēres,* the Chinese]: fine, glossy filament or thread produced by certain caterpillars; the thread or cloth made of it (see below): ADJ. pertaining to or consisting of silk. SILKEN, a. *sĭlk'n,* made of silk; resembling silk; dressed in silk; soft; tender. SILK'Y, a. *-ĭ,* possessing the qualities of silk; soft; glossy; having the appearance of silk. SILK'INESS, n. *-ĭ-nĕs,* the state of being silky; softness and smoothness. SILK-COTTON TREE, very large Indian tree whose seed-capsules contain a downy substance like silk (see SILK-COTTON). SILK GOWN, in England, the dress or distinguishing badge of one who has been appointed queen's counsel. SILK'MAN, in *OE.,* a dealer in silks. SILK-MERCER, a dealer in silks. SILK-MILL, a mill for manufacturing silk. SILK THROWER or THROWSTER, one who prepares silk thread for weaving. SILK-WEAVER, one who weaves silk stuffs. SILKWORM, the caterpillar that produces the delicate silk filaments from which silk is manufactured (see SILK).

SILK · one of the most favorite materials for raiment—product of a worm This insect we will consider first.

The SILKWORM is the caterpillar of the SILKWORM MOTH, of which there are numerous species belonging to the genus *Bombyx* and other genera of family *Bombycidæ*, lepidopterous insects of the section popularly known by the name Moth (q.v.). The *Bombycidæ* have a very short and rudimentary proboscis, living for a very short time in their perfect state, and taking little or no food; the body is thick and hairy; the wings are large and broad, either extended horizontally when at rest, or inclined like the sides of a roof; the antennæ are pectinated. The caterpillars feed on the leaves and other tender parts of trees or other plants; the chrysalids are inclosed in a cocoon of silk, which gives to some of the species great economical importance. The most important is the COMMON SILKWORM (*Bombyx mori*), native of n. provinces of China. The perfect insect is about half an inch in length, the female rather larger than the male; the wings meeting like the sides of a roof; the color whitish, with a broad pale brown bar across the upper wings. The females generally die very soon after they have laid their eggs, and the males do not survive much longer; but some races produce two, and some three, generations. The eggs number 500 or more, about the size of a pin's head, not attached together, but fastened to the surface on which they are laid by a

Silkworm Moth (*Bombyx mori*) in its various stages.

gummy substance, which, when dry, becomes silky. They are laid in the end of summer, and are hatched in the beginning of next summer. The caterpillar is at first very small, not more than a quarter of an inch in length, but rapidly increases in size, till, when full grown, it is nearly three inches long. It is of yellowish-gray color. The head is large. On the upper part of the last joint of the body is a horn-like process. The skin is changed four or five times during the growth of the caterpillar. Before each change of skin, it becomes lethargic, and ceases to eat, whereas at other times it is very voracious. When the skin is ready to be cast off, it bursts at the forepart, and the caterpillar then, by continually writhing its body, without moving from the spot, thrusts the skin backward; but silkworms frequently die during the change of skin. A

very rapid increase of size takes place while the new skin is still soft. The natural food of the silkworm is the leaves of the white mulberry, but it will feed on the leaves of some other plants, e.g., the black mulberry and the lettuce. When so fed, however, it produces silk of inferior quality. The silk-producing organs are two large glands (sericteria) containing a viscid substance, which extend along great part of the body, and terminate in two *spinnerets* in the mouth. These glands become very large when the change to the chrysalis or pupa state is about to take place. When about to spin its cocoon, the silkworm ceases to eat, and first produces the loose rough fibre which forms the outer part of the cocoon, and then the more closely disposed and valuable fibre of its interior. In this process, the position of the hinder part of the body is little changed, but the head is moved from one point to another; and the cocoon when finished is much shorter than the body, which, however, being bent, is completely inclosed in it: it is about the size of a pigeon's egg. Each fibre of silk, under a microscope, is seen to be double, being derived equally from the two silk-producing organs of the caterpillar. A single fibre often exceeds 1,100 ft. in length. The time of the silkworm's life in the caterpillar state is generally about 8 weeks. About 3 days are occupied in spinning the cocoon; after which 2–3 weeks elapse before the cocoon bursts and the perfect insect comes forth. The natural bursting of the cocoon is, however, injurious to the silk, and the silkworm rearer prevents it by throwing all the cocoons into boiling water, except those which he intends to keep for maintenance and increase of his stock. These he selects with care, so that he may have about an equal number of male and female insects, the females being known, even in the chrysalis state, by their larger size. The cocoons intended for production of moths are placed on a cloth in a room of which the temperature is near, but does not exceed, 72° F.; the moths make their appearance in 11–15 days, and immediately couple; the females are then placed in a darkened room till they deposit their eggs. It is an interesting peculiarity of this valuable species of moth that neither in the caterpillar nor in the winged state does it show that restless disposition which belongs to many others, the caterpillars remaining contentedly in the trays or boxes in which they are placed, feeding on the leaves with which they are there supplied, and at last only seeking a proper place to assume the chrysalis form on small bundles of twigs which are placed for that purpose above the trays; the perfect moths, in like manner, abiding almost in one spot, and scarcely caring to use their wings. Owing to this peculiarity they are capable of being reared and managed in a way otherwise impossible.

The silkworm is liable to various diseases, particularly to *Silkworm-rot*, or *Muscardine* (q.v.), and *Pebrine*. It is estimated that the latter disease caused in 13 years (1853–66) a loss to Italy and France of about $600,000,000. Pebrine manifests itself by dark spots on the skin of the larvæ: the worms are weak, sickly; the cocoon soft and

loose. The disease is hereditary. Pasteur's cure enables the cultivator to stamp out the disease: it consists in examining microscopically the pupæ, and rejecting and destroying all generations in which diseased chrysalids are found; the moths, too, before coupling are examined microscopically.

Of the other species of silkworm, many are rapidly increasing in commercial importance. The following is an enumeration of the chief silk-producing insects; those in Italics are not as yet employed in manufactures:

Bombyx mori.—The common silkworm, native of India, and reared in other parts of the world.

B. cræsi.—Crosses have been obtained between this and B. mori, yielding excellent silk, at Mussooree.

B. textor.—Native of Mussooree.

B. sinensis.—China.

B. Huttoni.—Silk collected in Mussooree.

B. Horsfieldi.—Native of Java.

Attacus atlas.—Native of India, and said to yield some of the 'Tussah Silk.'

A. Guerini.—Native of Bengal.

A. ricini.—Native of Assam.

A. cynthia.—The 'Eria' or 'Arrindy' silkworm, native of India, extensively raised in Hong-Kong, Japan, Nepaul, Mussooree, Java, and to some extent in southern Europe. It feeds on the leaves of the Ailanto (q.v.) tree: in Japan a large product is now obtained from caterpillars fed on these leaves, and the silk is cheaper and the fibre more durable than the mulberry-silk, though not so fine and with less gloss.

Antheræa Mezankooria.—The Mezankooria silk-moth.

A. Paphia.—The true Tussah or Tussur Moth, native of Darjeeling and other parts of Upper India. It is produced very extensively, and is collected chiefly in the jungle districts by the Sahars and other half-wild castes who live in the jungles. The cocoons are so carefully concealed in the leaves that much care is required to discover them, the only indication being the dung of the caterpillar under the trees. The tussah silk is easily wound off from the cocoons in the same way as that of the common silkworm.

A. Assama.—The Moonga, or Moogha, native of Assam.

A. Pernyi.—North China.

A. Perrottetti.—North China.

A. Roylei.—Mussooree.

A. Helferi.—Darjeeling.

A. Jana.—Java.

A. Frithii.—Darjeeling.

A. Larissa.—Java.

The preceding seven are called Tussah moths.

Actias Selene.—Darjeeling.

Saturnia pyretorum.—China.

S. Grotei.—Darjeeling.

Læpa Katinka.—Java.

Neoris Huttoni.—Mussooree.

Caligula Tibetæ.—Mussooree.

C. Sinda.
Salassa Lola.—Southeast Himalaya.
Cricula triferrestrata.—Java.

It will be seen by the above list that hitherto very few of the silk-moths have been turned to man's profit. The first in importance after the common silkworm is the true *Tussah,* next the *Moonga,* the silk from both of which can be wound off the cocoon; and then the *Eria,* which cannot be wound easily, and is therefore generally carded.

Silk appears not to have been well known to the ancients: though several times mentioned in translations of the Bible, the best authorities deny that it is in the original, or that it was known to the Hebrews. Among the Greeks, Aristotle is the first who mentions it, and he says only that 'Pamphile, daughter of Plates, is reported to have first woven it in Cos;' and from all the evidence, it appears that the natives of Cos received it indirectly (through the Phœnicians and Persians) from China. The silken webs of Cos found their way to Rome, but it was very long before they were obtainable, except by the most wealthy. The cultivation in Europe of the worm itself did not take place until A.D. 530, when, according to an account by Procopius, the eggs were brought from India (China) to Emperor Justinian by some monks.

In China the cultivation of silk is of the highest antiquity; and according to the greatest Chinese authorities, it was begun by Si-ling, wife of Emperor Hoang-ti, B.C. 2600, and the mulberry was cultivated for the purpose of feeding the silkworm only 40 years later.

Since its introduction to Europe, it has always formed a great branch of industry in Italy, Turkey, and Greece, and it has been cultivated to some extent in France, Spain, and Portugal. In England and the United States efforts have been made to cultivate it; though in England the climate is not sufficiently warm and is too variable. It requires 1,600 worms to raise a pound of silk.

French silk experts estimate the product of raw silk in the world at 70,000,000 pounds, having a value of $475,000,000. The combined product of China, Japan, India, Tonquin and Annam is 32,000,000 pounds. The value of the French product, 1900, is 441,350,000 francs. The German product (Crefeld factories), 1901, was valued at 82,232,939 marks; that of Switzerland (Zurich), 113,460,000 francs; Italy, 70,000,000 francs; Great Britain, $15,000,000; Russia, equal to $21,000.000; Spain, equal to $4,000,000. The United States silk imports, unmanufactured, 1908, were valued at $64,546,903. There were 483 establishments in the United States in 1900 engaged in producing manufactures of silk. These establishments paid $20,982,194 in wages and salaries, the value of the products being $107,256,258. In that year there were 1,045,304 throwing spindles in operation, which consumed 1,550,291 pounds of spun silk and 9,760,770 pounds of raw silk.

Raising Silkworms.—It is of the first consequence in

production of silk that one of the species of mulberry should be cultivated, and that it should be so favorably situated as to climate that its foliage is in readiness for feeding the young worms when they are first hatched from the eggs. The species best adapted is the white mulberry, *Morus alba*, but the black mulberry and other species are hardly inferior. It is said that in parts of China the silkworm is easily reared on the trees in the open air. So little has it a tendency to wander far from the place of its birth, if food be at hand, that it requires only a warm dry atmosphere to bring it to perfection, but usually, even in China, and in all other countries, it is thought desirable to raise the silkworm in properly arranged buildings, and to supply it with mulberry leaves gathered from day to day. In India, China, and other tropical countries, the eggs hatch readily at the proper time by the natural heat; but in s. Europe artificial heat is almost always required; formerly, the heat of fermenting dung was found serviceable, and the warmth of the human body was also used, the eggs being carried in little bags in the bosom of the cultivators; but now they are regularly hatched by stove-heat, beginning with a temperature of 66° F., which is gradually increased through ten days to 78°, at which it is maintained until the eggs are hatched. Experience has shown that the operation is facilitated by first washing the eggs with clean water; and some cultivators wash them in wine also, the advantage of which is questionable. Washing is found to remove a certain gumminess and other impurities from the eggs, which would otherwise impede the hatching. When the silkworms have been regularly developed as above described, it is usual to place above the trays various little contrivances for the caterpillar to spin within: many of the Italian growers employ an ingeniously simple arrangement, which lasts many seasons, and when not in use, occupies very small space. It consists of a number of thin slips of wood, about an inch and a half broad, and all cut sufficiently long to reach across the trays. They are each cut at intervals of an inch half through as in fig. 1, so that one will fit into another, as in fig. 2; and when complete, they all form a series of cells, which, set in a tray (fig. 3), form the very best receptacles for the silkworm to spin in. When not in use, the whole arrangement, can be compressed into very small compass, as in fig. 4, for convenience of storage. Others use little cones of paper, or small twigs, among which the cocoons are spun.

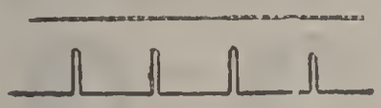


Fig. 1.

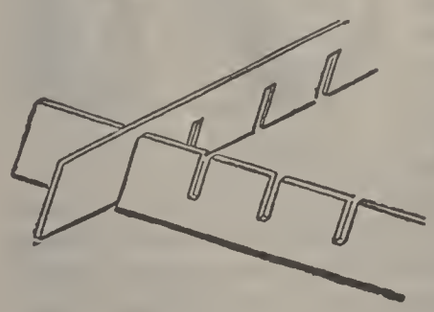


Fig. 2.

In feeding the worms, care is taken so to distribute the food on the shelves or in the trays that the insects shall not

crowd together; and for this reason, the most careful cultivators chop the leaves small, and strew them very evenly about. Great care is taken not to let the worms of one

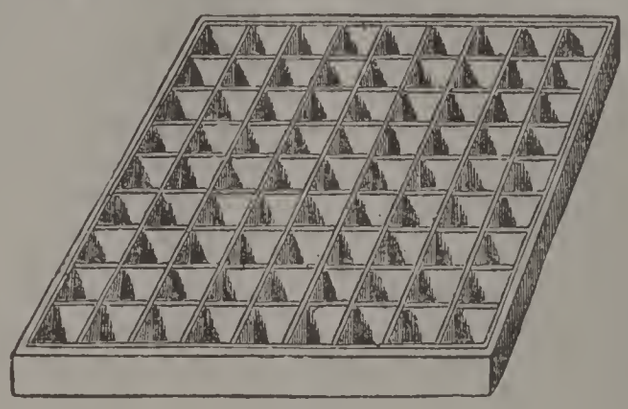


Fig. 3.

hatch mix with those of another, unless of exactly the same age, otherwise the stronger insects would deprive the younger of their food. Many other niceties of attention

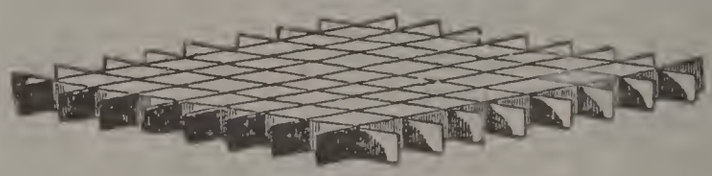


Fig. 4.

are required, which altogether render the successful rearing of silkworms a matter of anxiety and labor.

SILK: *its Preparation.*—When the cocoons are completed, which is known by the absence of any sound within, they are carefully sorted, and a certain number are kept for laying. The sexes are readily known by difference of shape as well as of size, the female being plumper, as in fig. 5; and the male (fig. 6), besides being much smaller, having a central depression and sharper extremities. The French growers sort them into nine varieties, those which are less compact, or in which the worm has died—a fact known by external indications—being separated from the good ones. When the sorting is finished, the cocoons are placed in an oven with gentle heat, which kills the inclosed chrysalis, otherwise they would all become *perforated* by the insect eating through: they are then prepared for winding by first removing the flossy covering, which is often somewhat hard and compact. The cocoons are placed in basins of water, kept warm by charcoal fires, or, in the larger establishments, by steam. This softens and dissolves the natural gum which coats the silk, and makes the various coils of silk adhere together in the cocoon. The operator then takes a small branchy twig, and stirs them about in the water. This is sure to catch hold of any liber-

Fig. 5.

Fig. 6.

ated ends which may be floating in the water. From three to five of these ends are taken and twisted together with the fingers, so as to unite them into one thread, and this is passed through a polished metal or glass eye in the reeling-machine, which is so far from the hot-water basin as to give the softened gum on the silk time to dry in its passage from the basin to the reel. In large *filatures* or silk establishments, complex machinery is used for winding; but reeling apparatus of the greatest simplicity is used by the Chinese, E. Indians, and others with almost equal effect when carefully done, except in the amount of work accomplished. In all cases, however, the principle is the same, and is very simple, as shown in fig. 7, in which *a* shows the small pan of warm water holding the cocoons.

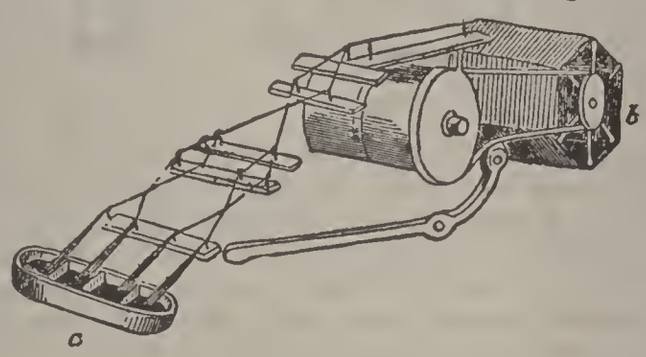


Fig. 7.

the threads from which are gradually united, and wound on the reel *b*. Great care and skill are required in reeling silk from the cocoons, because, though the reeler starts with four or five cocoons, not only are their individual threads apt to break, but they are not all of the same length, so that one will run out before the others. These matters are carefully watched; and as often as a thread breaks, or a cocoon runs out, another thread is joined on, and is made to adhere to the compound thread on the reel by its natural gumminess. Each cocoon generally yields 300 yards of thread, so that it takes 1,200 or 1,300 yards to make 300 yards of the filament of *raw silk*, by which name the reeled silk is always known. The raw silk is made up into hanks of various sizes. That from China and Japan is tied in packages of six hanks each, technically called *books;* and sometimes the ends of these books are covered with silken caps very curiously formed out of a single cocoon, so managed as to form a filmy cap sufficiently large to cover a man's head. The method by which the Chinese accomplish this is unknown in Europe. These caps or bags, when closed, are sometimes nearly a foot square, and much of the wadding used by the Chinese dressmakers for padding is made by placing these bags upon each other to the required thickness.

Notwithstanding the care taken in reeling the silk from the cocoons, and forming several threads into one, it is not ready for the weaver, but has to undergo the processes called collectively *throwing*. This is a special trade, the *silk throwster* usually conducting it in large mills with extensive machinery, where the above processes all are

carried on, usually by steam-power. The silk reaches the throwster in hanks as imported. These are put into clean soap and water, and carefully washed, ties having been placed at intervals, to prevent the silk entangling. After being dried by hanging in the drying-room, they are

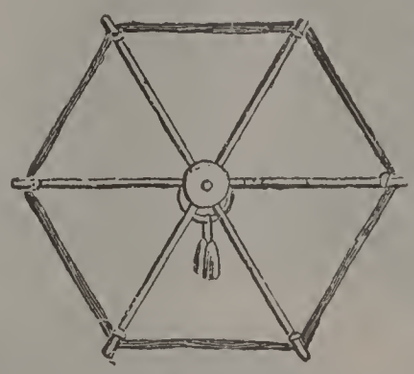


Fig. 8.

Fig. 9.

placed on large skeleton reels called *swifts* (fig. 8), so adjusted that they will hold the hanks tightly. Fig. 9 is a front view of a *swift*, and shows that the spokes *a*, *a*, are in pairs. They are made of thin pieces of lance-wood, and each pair are rather nearer together at the axle than at the circumference, where they are connected together by a small band of cord *b*. These bands are so tied that they will slip down easily to admit of the hanks being placed; then, by pushing the cords upward, the hank can be stretched to its fullest extent. This is necessary to compensate for the varying lengths of the hanks received from different countries.

When the *swifts* are set in motion, the silk is carried from the hanks to bobbins, upon which it is wound for convenience of further operations. The bobbins are then taken from the *winding* to the *cleaning* machine, when they are placed on fixed spindles, so that they will turn with the slightest pull; and the thread is passed through a small apparatus attached to the machine, which is specially called the cleaner, and consists essentially of two polished smooth-edged blades of metal (*a*, *a*, fig. 10), attached to a part of the frame of the machine, *b*. They are held together by the screw *c*, and are slightly opened or closed by the other screw, *d*, so that the thread can be put between them down to the small orifice, *e*, and then, by tightening the screw, preventing its return, after passing through this small hole, which is the gauge of the thread, and which removes any irregularities or adherent dirt. The silk next passes over a glass or metal rod, and then through another small hole, much larger than that of the *cleaner*, and usually made in glass, on to the bobbin, upon which it is wound by action of the machine. The next process is *twisting* the cleaned thread, by which it becomes better adapted for being combined with other threads.

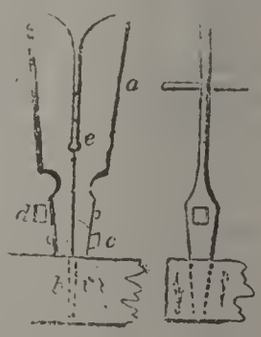


Fig. 10.

Doubling is the next process, and this consists in running off a number of bobbins of *twisted* silk on to one bobbin of a larger size, which is put into the *throwing* machine, when the ends of the *doubled* silk are passed through a smooth hole on to a large reel, which rewinds it into hanks, but twisting the threads into fine cord as it goes from the bobbins to the reel. This operation of *throwing* derives its name from the Saxon *thrawan,* to whirl or twist. After this, the hanks have to be again wound on reels and bobbins for the weaver, the former for the warp, the latter for the weft. For many purposes, only some of these operations are required. Thus for common and light fabrics, such as *Persian, gauze,* etc., only the two first are needed—viz., *winding* and *cleaning,* and the material is called *dumb-singles.* If it has been *wound, cleaned,* and *thrown,* it is called *thrown-singles,* and is used for weaving common broad stuffs, or plain silks and ribbons. If *wound, cleaned, doubled,* and *thrown,* it is called *tram,* and is used for richer silks and velvets, but only for the weft or shoot; and if *wound, cleaned, spun, doubled,* and *thrown,* it is called *organzine,* and is used for warps of fine fabrics.

Before winding the cocoons, a flossy portion has to be removed; and after all has been wound off, another portion remains, like a compact bag; these are collected and sold under the name *waste-silk,* and to these are added the fragments of broken threads, which accumulate in considerable quantities during the reeling and throwing operations. Formerly, little use was made of waste-silk; some of it was employed by engineers and others for mere cleaning purposes; though, as early as 1671, a proposition was made by an English manufacturer named Edmond Blood to make it available by carding it with teasels or rowing-cards—for which invention he took out a patent, but apparently did not bring it into use. Under a later patent the waste (i.e., remains of cocoons after reeling, floss or outer fibers of cocoons, and waste from the rowing processes) is all spun into yarn, thereby greatly economizing the use of silk, as the quantity of silk-waste always greatly exceeds the amount of good silk reeled off. Processes employed in production of silk yarn from the waste differ little from those for spinning other materials. See SPINNING.

The principal silk-manufacturing centers in the United States are Paterson and Hoboken, N. J., Brooklyn, and New York, for manufactures of reeled silk; and S. Manchester and Hartford, Conn., for manufactures of spun silk. The manufactures of Britain are chiefly in Spitalfields, London, at Macclesfield and Congleton in Cheshire, at Derby, and in Glasgow.

Consult: Kelly, *Culture of Mulberry Silkworm,* Bulletin 39, Division of Entomology, United States Department of Agriculture (Washington, 1903; Bulletin 9); Villon, *La Soie* (Paris, 1890); Verson and Quajat, *Il filugello e l'arte sericola* (Padua, 1896).

SILK-COTTON: various silky fibres brought from tropical countries to Europe and the United States; all of the same general character, and produced by the trees composing the genus *Bombax* and other genera recently separated from *Bombax*, of nat.order *Sterculiaceæ*, known as S.-C. trees. These trees are natives of tropical Asia, Africa, and America. The fibre fills their large woody capsules, enveloping the seeds, and is produced in great abundance; but is too short, too smooth, and too elastic to be spun by the machinery used for cotton, though attempts have been successfully made on a small scale in India to spin and weave it; and the fibre of *Bombax villosum*, of beautiful purple color, is woven into cloth and made into articles of dress in New Spain. S.-C. is much used for stuffing pillows, mattresses, and sofas: it has the fault, however, of being easily broken and reduced to powder. It might probably be very useful in manufacture of gun-cotton and collodion. The S.-C. of the E. Indies is imported into western lands under the name of *Moc-main.—Bombax ceiba*, the common S.-C. tree of the W. Indies and S. America, attains a very great size—its trunk sometimes being so thick that it could not be encompassed by the outstretched arms of 16 men, and canoes are hollowed out of it of an average burden of 25 tons. The wood is soft and spongy, but is used for many purposes, and when cut into planks, and saturated with lime-water, it bears exposure to the weather many years.—*Bombax Malabaricum*, or *Salmalia Malabarica*, is the common S.-C. tree of the E. Indies: it is a tall tree, covered with formidable thorns. Although it is a tropical tree, its leaves fall annually; and just before the fresh leaves appear, it is covered with crimson tulip-like flowers, so abundant that, 'when they fall the ground for many roods on all sides is a carpet of scarlet.'

The fibre of the capsules of *Chorisia speciosa* and *C. Pecholtiana* trees, nearly allied to the genus *Bombax*, and natives of Brazil, is known as VEGETABLE SILK. It has a beautiful satiny lustre, and is very light, but no mode of spinning and weaving it has yet been invented.

SILK'-WEED, or MILK'-WEED: see ASCLEPIADACEÆ: ASCLEPIAS.

SILK'WORM GUT: material used by anglers for dressing the hook-end of the fishing-line; prepared from the silkworm at the period when it is just about to spin, and the sericteria or silk-vessels are distended with the secretion. The worms are immersed 12 or 14 hours in strong vinegar, and then taken separately, and pulled in two very gently. The skilled operator knows at sight if the soaking in vinegar has been sufficient, and if so, he lays hold of one end of the viscid secretion, which is seen in the silk glands, and attaches it to the edge of a board; the other end he stretches to the other edge of the board, and attaches it with a pin. When a number are drawn across the board, it is set in the sun for the threads to dry, when they are tied into bundles for use. They are produced chiefly in Italy and Spain.

SILL, n. *sĭl* [Low Ger. *sull;* Ger. *schwelle,* a threshold: Sw. *syll;* Dan. *syld,* base of a framework, ground-sill: AS. *syl,* a base, support: Gael. *sail,* a beam of wood]: any basis of stone or wood on which a structure rests; the timber or stone forming the bottom of a door or window; the threshold of a door or window; wooden plate along the bottom of a partition: in *mining,* flat-bedded strata of sandstone or similar hard rocks; in *fort.,* the inner edge of an embrasure.

SILL, EDWARD ROWLAND: American scholar and poet: b. Windsor, Conn., 1841, Apr. 29; d. 1887, Feb. 27. He was graduated from Yale in 1861, entered business in California, but returned to the East, and studied at the Harvard Divinity School. His views toward the ministry, however, he soon abandoned; and he became literary critic on the staff of the New York *Evening Mail.* Thence he went to Ohio, where he did some teaching, and to California, where he was made principal of the Oakland high school (1871) and professor of English literature in the University of California. In 1883 he returned to Ohio to devote himself wholly to literary work. Sill did not write readily, nor willingly collect what he had at intervals printed in magazines, particularly the *Atlantic.* He won, nevertheless, a recognition which, if not general, is ample, and a just tribute to real gifts. He wrote with a certain terse austerity not, as has been pointed out, unlike Emerson. Indeed he was, in thought and manner, a later transcendentalist. One of his poems, *The Fool's Prayer,* is the property of every anthology. The posthumous selection, *Poems* (1888), contains his best. *Hermione, and Other Poems,* appeared in 1899, and in 1900 *The Prose of Edward Rowland Sill,* with an *Introduction Comprising Some Familiar Letters.*

SILLABUB, or SYLLABUB, n. *sĭl'lă-bŭb* [a corruption of Eng. *slap-up* or *slub-up:* Low Ger. *slabb'ut;* Swiss *schlabutz,* watery food]: a frothy food prepared by stirring up briskly, or by whipping up, a mixture of cream and wine, cider, or spirits, with spice, etc.—sometimes by milking from the cow into wine, etc.

SILLADAR HORSE, *sĭl'lă-dâr* [Hind. *silah,* arms, accoutrements]: Indian irregular cavalry, in which every horseman maintains and equips himself and horse for a certain amount of pay—more correctly SILAHDAR; vernacularly, SILEDAR.

SILLER, n. *sĭl'lėr* [a corruption of SILVER]: in *Scot.* and *prov. Eng.* silver; money in general.

SILLERY, n. *sĭl'ėr-ĭ:* a non-sparkling champagne wine, so called after the Marquis of Sillery, owner of the vineyards where it is produced.

SILLIMAN, BENJAMIN: American scientist: b. North Stratford, Conn., 1779, Aug. 8; d. New Haven, Conn., 1864, Nov. 24. He was graduated from Yale in 1796, studied law, and was admitted to the bar in 1802, but

accepted the chair of chemistry and natural history at Yale in 1802. He went abroad in 1805 to continue his studies, and while in Edinburgh became interested in geology. On his return home he made a geological survey of a part of Connecticut, the first survey of the kind made in the United States, and in 1807 published an account of the celebrated Weston meteorite of 1807, Dec. 14. In 1811 he began a series of experiments with the compound blow-pipe, obtained for the first time in the United States the metals sodium and potassium, and discovered in 1822 the fusion of the carbons in the voltaic arc. He founded the *American Journal of Science* in 1818, acting as its sole editor until 1838, and as senior editor until 1846, opened the Lowell Institute in Boston with a series of lectures on geology in 1838, and in 1840 was elected president of the American Association of Geologists. He resigned his chair at Yale in 1853 and was made professor emeritus, but continued to lecture until 1855, when he retired. He was named by congress for one of the original members of the National Academy of Sciences in 1863. His publications include: *Journal of Travels in England* (1810); *Elements of Chemistry* (1829); *Consistency of Discoveries of Modern Geology with the Sacred History of the Creation and the Deluge* (1837); *Narration of a visit to Europe in 1851* (1854); etc.

SILLIMAN, Benjamin: American chemist, son of the preceding; b. New Haven, Conn., 1816, Dec. 4; d. there, 1885, Jan. 14. He was graduated from Yale in 1837, and in 1838 became instructor in chemistry, mineralogy, and geology at Yale, was appointed professor of applied chemistry in 1846, and in 1854 succeeded his father in the chair of chemistry, a position he occupied until his death. He was one of the founders in 1847 of the Yale Scientific School, and was professor of medical chemistry and toxicology in the University of Louisville, Ky., in 1849-54. He was in charge of the departments of chemistry, mineralogy, and geology at the World's Fair in New York in 1853, was elected one of the original members of the National Academy of Sciences in 1863, and in 1869 became one of the state chemists of Connecticut. He published: *First Principles of Chemistry* (1846); *Principles of Physics* (1854); *American Contributions to Chemistry* (1875); etc.

SILLIMANITE: a mineral occurring in long slender crystals, and fibrous masses, and composed of silicate of aluminium (silica 36.9, alumina 63.1 = 100). Its crystals belong to the orthorhombic system; its hardness varies from 6 to 7 and its specific gravity from 3.2 to 3.3. The color is various shades of brown, or gray, or greenish. The streak is uncolored, and the mineral varies from transparent to translucent. It occurs in gneiss, mica schist, and other metamorphic rocks, in Massachusetts, Connecticut, New York, Pennsylvania, Delaware, North

Carolina, etc. The name was given in honor of Professor Silliman, of New Haven.

SILLON, n. *sĭl'on* [F.]: in *fort.*, a work raised in a ditch to defend it, if too wide. It must be lower than the main works, but higher than the covered way.

SILLOTH, *sĭl'loth:* town and watering-place of England, of quite recent origin in the county of Cumberland, at the terminus of a branch of the North British railway, 20 m. w.n.w. of Carlisle; picturesquely situated on the Solway. The port is of growing importance, and has a good stone dock, with a fine jetty, 1,000 ft. long. An important new dock, made by the railway company at a cost of £90,000, was opened 1885. Silloth, which commands a fine view, is much resorted to for sea-bathing, the climate being mild and salubrious, and considered highly favorable for those affected with pulmonary ailments. The mean annual temperature is 49°, being the same as that of Worthing on the coast of England, and only 1° below that of Torquay. Silloth is of easy access from all parts of England by railway; and steamers ply at stated intervals to and from Liverpool and other places. Pop. 2,600.

SILLOWAY, *sĭl'lo-wā*, THOMAS WILLIAM: architect: b. Newburyport, Mass., 1828, Aug. 7. After receiving a thorough education in the arts of design, he opened an office in Boston, 1851, since which time he has prepared plans for the construction or alteration of about 500 church and other public buildings, including the Montpelier, Vt., capitol. After preaching for some years, he was ordained as a Universalist 1862. Among his publications are several works on building and church music, and with L. L. Powers he published *Cathedral Towns of England, Ireland, and Scotland* (1883). Other publications are: *Text Book of Modern Carpentry; Warming and Ventilation*, and editor with another of the 6th ed. of *Shaw's Civil Architecture.*

SILLY, a. *sĭl'lĭ* [AS. *sætig;* Ger. *selig,* blessed, happy —constantly used by older writers in the sense of 'simple,' 'unknowing': Goth. *sels*, good, kind]: weak in intellect; simple; proceeding from want of understanding or judgment; imprudent; indiscreet; in *OE.*, weak, helpless; frail; rustic; rude. SIL'LILY, ad. *-lĭ-lĭ.* SIL'LINESS, n. *-nĕs*, weakness of understanding; want of sound sense or judgment.—SYN. of 'silly': witless, shallow; foolish; simple; brainless; unwise; indiscreet; imprudent; harmless; innocent; inoffensive.

SILO, n. *sī'lō* [L. *sirus*, Gr. *siros*, a pit for keeping corn in]: close pit, or construction, for storing grass and other fodder, which is then called *Ensilage* (q.v.).

SILOAM, *sĭ-lō'am*, or SILOAH, *sĭ-lō'ah*, or SHILOAH, *shĭ-lō'ah* [Heb. *Siloah*, probably meaning 'sent']: pool or tank in Jerusalem, on the s. slope of that part of the temple-hill called Ophel, about 1,200 ft. s.s.w. of the

'fountain of the Virgin,' and connected with it by a winding underground passage. In 1880 some boys playing in the pool crawled into this ancient tunnel, and one of them noticed a tablet bearing an inscription. That inscription, as deciphered by scholars in 1881, tells of errors of measurement committed by the miners and how they were corrected. In places the inscription is undecipherable, but, line for line, it is rendered thus:

1. Lo the tunnel. Now this is the history of the tunnel. While yet the miners were plying
2. The pick, each toward his fellow and while there were yet three cubits to be cut, there was heard the voice of a man.
3. Calling to his fellow, for there was a *misdirection** in the rock on the right hand . . . and on the day
4. Of tunneling through, the cutters smote pick against pick, and there flowed
5. The water from the channel to the pool, 12,000 cubits, and . . .
6. Cubits was the height of the rock above the excavators' heads.

SILOMETER, n. *sī-lŏm'ĕ-tĕr* [first element doubtful, Diez derives it from Scand. *sila,* to plow, and Littré from F. *siller,* to make sail; Gr. *metron,* measure]: instrument of various forms for emasuring, without the aid of the log-line, the distance passed over by a ship.

SILPHIUM, *sĭl'fĭ-ŭm* [from a Gr. word referring to some plant that produced resinous gum]: genus of plants, known as rosin-plants, of family *Compositæ.* The flowers have fertile rays and sterile disk florets, on a chaffy receptacle; the color is yellow; and the herbs are tall, coarse, perennial, with resinous juice.—ROSIN-WEED or COMPASS-PLANT (*S. laciniatum*), 3-6 ft. high, has pinnately parted and slashed leaves, that, on the prairies, are disposed to turn their edges n. and s.; hence the name.—Prarie Dock (*S. terebinthinaceum*) is smooth, slender 4-10 ft. high, with leaves 1-2 ft. long, and has a pinnatifid variety with deeply cut leaves.—Three other w. species, *S. trifoliatum, S. integrifolium,* and the Cup-plant, *S. perfoliatum,* are described in their names, the last having a square stem and connate-perfoliate leaves.

SILT, n. *sĭlt* [from the obsolete Eng. verb *sile,* to ooze through, to sink down: Sw. *sila,* to strain, to filter: Low Ger. *silen,* to drain off water: Gael. *sile,* to filter (see SILE)]: properly, the fine mud which collects in lakes and estuaries, but now used to designate any gradual deposit of mud, clay, or sand: V. to become choked or obstructed with mud, sand, or other deposit; to percolate; to ooze. SILT'ING, imp.: N. the process by which a harbor, inlet, or estuary becomes choked or obstructed by the deposition of mud or sand, etc. SILT'ED, pp.

SILURE, n. *sĭ-lôr',* or SILURUS, n. *sĭ-lô'rŭs* [L. *silūrus;* Gr. *silouros*]: large fresh-water fish; a shad.

* Conjectural.

SILU'RIAN ROCKS: large division of the Paleozoic rocks between the Archæan and Devonian strata. The term 'Silurian' was introduced by Sir R. I. Murchison, and is derived from the district where he investigated the strata; S. Wales having of old been occupied by a people known to the Romans as Silures.

The Silurian system contains an enormous thickness of rocks—nearly 30,000 ft., according to some estimates; but Archibald Geikie's estimate of average thickness is 18,550 ft.: the absolute thickness is greatly increased by immense beds of interstratified igneous rocks. The upper limit, underlying the Old Red Sandstone, is universally accepted, but there has been diversity of opinion as to the inferior boundary. Prof. Sedgwick, having described the rocks of N. Wales, at first considered older than the series which Murchison had illustrated, designated them Cambrian. This name has been retained for the immense mass of indurated shales and sandstones of a thickness greater even than that of the Silurians, which contain only faint traces of organic life, and underlie the Llandeilo formation. But Sedgwick claims also the Lower S. R. as a portion of his system; the priority of name, and the uniform facies of the organic remains of the whole of the S. R., have, however, induced geologists to consider the limits of the system to be those originally given by Murchison.

The subdivisions of the rocks of the period are the following:

UPPER SILURIAN ROCKS.

	Thickness in Feet.
Upper Ludlow—	
1. Downton Sandstone and Tilestones	80 to 1,000
2. Upper Ludlow Shale	800
Lower Ludlow—	
3. Aymestry Limestone	150
4. Lower Ludlow Shale	900
Upper Wenlock—	
5. Wenlock Limestone	300
Lower Wenlock—	
6. Wenlock Shale	1,400
7. Woolhope Limestone and Denbighshire Grit	150

MIDDLE SILURIAN ROCKS.

Upper Llandovery—	
8. Tarannon Shale	1,000
9. May-hill Sandstone and Pentamerus Limestone,	800
Lower Llandovery—	
10. Llandovery Slates	1,000

LOWER SILURIAN ROCKS.

Caradoc—	
11. Caradoc Sandstone }	12,000
12. Bala Limestone. }	
Llandeilo—	
13. Upper Llandeilo }	1,500
14. Lower Llandeilo or Arenig Beds }	
Contemporaneous Volcanic Rocks	5,800

The typical Silurian strata are in Wales and the adjoining English county, Shropshire. Except the s. and s.e. districts, where the Old Red Sandstone and Coal-measures occur, the whole of Wales is composed of Silurian and Cambrian rocks. The same deposits are found in Cumberland and n. Lancashire. The whole of Scotland s of a

line from Dunbar on the e. to Girvan on the w. consists of graywacke rocks, slates, and limestones of Silurian age, except one or two small patches of Old Red, Carboniferous, and Permian strata. The rocks, till recently referred to an azoic group, below the lowest fossiliferous strata in n. Scotland, are now generally believed to be highly altered beds of this period. The s. boundary of these beds is a line drawn from Stonehaven to Helensburgh. A huge trough, filled with Old Red Sandstone and Carboniferous strata, separates the highly altered strata of the n. from the less altered deposits of the s. An extensive region of S. R. occurs in the s.e. counties of Ireland and in Galway; and a great tract of the same beds extends from the centre of Ireland (Cavan, etc.) to the coast of Down.

On the continent of Europe, Silurian strata have been examined and co-related with the British types: in Bohemia, by Barrande; in Scandinavia, by Angelin; in Russia, by Murchison and others. In Germany there are a few detached areas of S. R., seen in the Thüringer Wald (1,600–2,000 ft. of fucoidal schists representing apparently the Lower Silurian) and in the Harzgebirge. The S. R. are represented also in n.w. France and in w. Spain; similar strata are found in India, Australia, and S. America. In the N. Amer. continent the S. R. extend continuously over a very wide territory—viz., from the mouth of the St. Lawrence s. into Ala. and w. to the head of Lake Superior. The following table shows the succession of the S. R. in N. Y., where they are most typically developed.

UPPER SILURIAN.

IV. Oriskany formation.	Oriskany Sandstone (*Spirifer arenosus*).	Ludlow.
III. Lower Helderberg formation.	(4) Upper Pentamerus Limestone (*Pentamerus pseudogaleatus*). (3) Delthyris Limestone (*Meristella lævis*). (2) Lower Pentamerus Limestone (*Pentamerus galeatus*). (1) Water-lime (*Tentaculites, Eurypterus, Pterygotus*).	
II. Salina formation.	Onondaga salt group, nearly barren of fossils.	
I. Niagara formation.	(3) Niagara Shale and Limestone (*Halysites, Favosites, Calymene Blumenbachii. Homalonotus delphinocephalus, Leptæna transversalis*, etc.).	Wenlock
	(2) Clinton group (*Pentamerus oblongus, Atrypa reticularis*, etc.) (1) Medina group, Oneida conglomerate (*Modiolopsis orthonota*).	Upper Llandovery.

[Specific and generic names in parenthesis are names of fossils found in the several formations. The names, Ludlow, etc., in the last column, show the subdivisions of the original British S. R. to which these N. Y. formations are to be referred.]

LOWER SILURIAN.

II. Trenton formation.	(3) Cincinnati (Hudson River) group (*Syringopora, Halysites, Diplograptus pristis, Pterinea demissa, Leptæna sericea*.		
	(2) Utica group—Utica Shale.		
	(1) Trenton group	Trenton Limestone. Black River Limestone. Birdseye Limestone.	*Graptolithus amplexicaulis, Trinucleus concentricus, Orthis testudinaria, Murchisonia, Conularia, Orthoceras* etc.

SILURIAN ROCKS.

I. Canadian formation.	(3) Chazy group—Chazy Limestone (*Maclurea magna*, *Maclurea Logani*, *Orthoceras*, *Illænus*, *Asaphus*).
	(2) Quebec group (more than 100 species of trilobites of genera *Agnostus*, *Amphion*, *Conocoryphe*, *Illænus*, etc., and more than 50 species of graptolites).
	(1) Calciferous group (graptolites, *Lingulella acuminata*, *Leptæna*, *Conocardium*, *Ophileta compacta*, 14 species of trilobites of genera *Amphion*, *Bathyurus*, *Asaphus*, *Conocoryphe*).

(The Potsdam formation—containing some sponges, the earliest forms of graptolites, some brachiopods, trilobites of genera *Conocoryphe*, *Agnostus*, *Dikelocephalus*, *Olenellus*, etc.—is, with the Acadian, referred to the Cambrian rocks.)

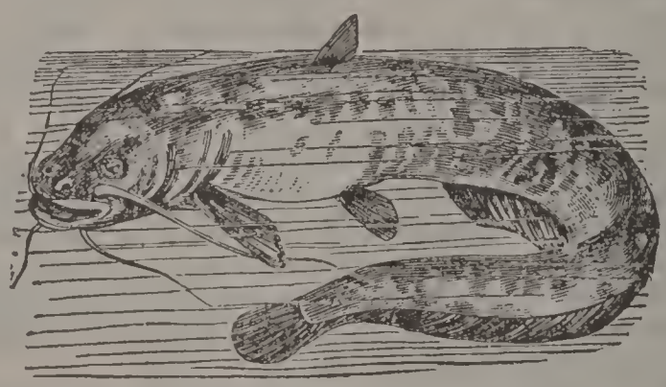
The rocks of the Canadian period are exposed to view in n. N. Y. and Canada; in n. Mich. and Wis.; in Vt. (Green Mts.); in the e. Appalachian chain s. from N J.; in Mo., Ark., and the Rocky Mts. The limestones of the Trenton group extend in a broad belt to Wis. and Mo., having in some places (Penn.) a thickness of 2,000 ft. The Cincinnati group (which constitutes the surface-rock in s.w. Ohio) consists of alternate layers of blue limestone and calcareous shale: it is identified with the Hudson River group. In the Upper Silurian the rocks of the Niagara formation—Oneida conglomerate and Medina sandstone, Clinton group, and Niagara shale and limestone—are to a great extent calcareous, and occupy a large portion of the continent of N. America.

The life of the period presents a group of very characteristic organisms, which, except the fish-remains in the upper beds, all belong to the invertebrata. Many of them are confined to the S. R. or occur very rarely in some of the Paleozoic formations. The Graptolites are a strictly Silurian family of Zoophytes, and most of the forms of Trilobites are found only in this period, though some members of the tribe are found in rocks of Devonian and Carboniferous age. Besides these may be specified such forms as Heliolites and Favosites among the Corals; Actinocrinites and the Cystidians among the Echinoderms; Orthis and Lingula among the Brachiopods; and Lituites and Maclurea among the Cephalopods.

In all the immense thickness of S. R., no deposit has been discovered containing organisms that have lived on land. Some fragments have been noticed that have a faint resemblance to the branches of Lepidodendron, and minute bodies occur in the bone-bed (top of the Upper Ludlow rock), which are referred to the spores of a terrestrial cryptogam. The only other indications of plants are impressions believed to have been produced by sea-weeds. The anthracitic shales of Wales and Scotland probably derived their anthracite from the algæ that must have abounded in the Silurian seas. In Shropshire a number of shells have been found, whose nearest allies are littoral species, and these appear to indicate the existence there of an ancient shore. The S. R. are, however, generally sea-deposits; and Forbes has ingeniously shown, from the small size of the Conchiferæ, the paucity of spiral univalves, the great number of floating shells and of the pelagic Orthidæ, and

the great rarity, or absence, except in the upper beds, of fossil-fish, that it is most probable they were deposited in a sea more than 70 fathoms deep.

SILURIDÆ, *sī-lū'rĭ-dē:* family of malacopterous fishes, divided into many genera, and including a great number of species, mostly inhabitants of the lakes and rivers of warm countries. The S. have great diversity of form. Their skin is generally naked, but some have a row of bony plates along the lateral line, and a few are completely mailed with bony plates. The dorsal fin is single in some; others have two dorsal fins, the second sometimes adipose as in the salmon family. The dorsal fin is sometimes armed with a strong spinous ray, and in most of the family the first ray of the pectoral fins is very strong and serrated, so as to be capable of inflicting a severe wound, and by this these fishes are protected from alligators and other enemies. All have the mouth furnished with barbels, more or less numerous; the two principal barbels being on the upper lip, and formed by elongation of the intermaxillary bones. The barbels are believed to be organs of touch, probably of use in directing the fish to its prey. The bones of the head and other parts of the skeleton exhibit many peculiarities. The S. are generally inhabitants of muddy rivers, lurking among the mud. The only European species is the SLY SILURUS, SHEAT-FISH, or SHADEN (*Silurus glanis*), the largest of European fresh-water fishes, and sometimes found near mouths of rivers: it is plentiful in the Danube, the Elbe, and their larger



Sly Silurus (*Silurus glanis*).

tributaries, also in the rivers which fall into the Caspian Sea. It is found in some rivers of N. America. It attains a length of six or even eight ft., and a weight of 300 or 400 lbs. The flesh is white and fat; but soft, luscious, and not very easily digestible. In n. Europe it is preserved by drying, and the fat is used as lard. The habits of the fish are sluggish; it seems rather to lie in wait for its prey than to go in quest of it.—Several species of this family are found in the Nile, among which is the HARMOUTH or KARMOOT (*Clarias anguillaris*), a fish in general form and appearance much resembling that just described. It was anciently an object of superstitious regard in the Thebaïd. —N. America abounds with representatives of the family, both in species and numbers, known as Catfish (q.v.), now

distributed among six or more genera—*Amiurus,* of eastern streams; *Ictalurus,* of the great lakes and the west; *Hopladelus; Noturus;* and two salt-water, *Ælurichthys* and *Ariopsis.*

SILURIST, THE. See VAUGHAN, HENRY.

SILVA, *sĭl'vă,* and SIL'VAN, *-văn.* See SYLVA.

SILVANUS, n. *sĭl-vā'nŭs* [L.]: in *Rom. myth.,* a deity among the Romans, who had the care of fields and cattle, and presided over boundaries. He was represented usually as old, and bearing a cypress plucked up by the roots; and the legend of Apollo and Cyparissus was transferred to him. The usual offering to Silvanus was milk.

SILVANUS. See MARS.

SILVAS, n. plu. *sĭl'văz,* or SELVAS, n. plu. *sĕl'văz* [Sp. *selva,* a wood—from L. *silva,* a wood]: flat woodland region, the w. portion of the great plain of the Amazon, in n.w. Brazil. (*Pampas* are the vast treeless S. Amer. plains; *Llanos,* the treeless plains along the Orinoco.) The Silvas, about one-third of the whole plain, contain more than 700,000 Eng. sq.m., and consist of low-land on a dead level, densely covered with primeval forests, and annually inundated by the overflow of the mighty river or its tributaries. The forests are rendered wholly impenetrable by the denseness of the underwood, matted together as it is by creeping and climbing plants, which form myriads of festoons glowing with nature's brightest tints. The vegetation of the Silvas, under the stimulating action of the abundant irrigation, the intense tropical heat, and the inconceivable richness of the alluvium which constitutes the soil, shows an exuberance of growth far surpassing that of any other portion of the earth's surface, and from its very luxuriance, presents a bar to civilization no less effectual than do the barren deserts of Africa or the gloomy wastes of central Asia. The few travellers who have penetrated into this region have sailed up the Amazon and some of its tributaries; and from them we have received the little knowledge that we possess of this immense tract of wild forest. It is the haunt of innumerable wild animals.

SILVELA, FRANCISCO: Spanish statesman: b. Madrid 1843. He studied law, and entering political life was elected to the Cortes, where he became prominent as a Conservative. He several times held cabinet positions in ministries organized by Campos and Canovas, but in 1891 became the leader of a new Conservative party. On the downfall of the Sagasta ministry after the Spanish-American war he was appointed prime minister, as the recognized leader of the Conservatives and Catholics. He avoided extreme measures, and aroused opposition because he did not bring about the expected reforms; he therefore withdrew from the ministry in 1900, but was again placed at the head of the cabinet in December 1902.

SILVER, n. *sĭl'vĕr* [AS. *seolfor;* Goth. *silubr;* Dut. *zilver;* Dan. *sölv;* Ger. *silber*, silver]: elementary body; metal of peculiar white color, having brilliant lustre, malleable, ductile, and soft when pure; one of the noble metals (see below); money made of silver; anything having the lustre or soft splendor of silver: ADJ. white like silver; made of silver; soft and clear, as in the tones of the voice; in *OE.*, soft; gentle; quiet: V. to cover or coat with silver; to cover with an amalgam of tin and quicksilver, as a looking-glass; to adorn with mild or silver-like lustre; to make hoary. SIL'VERING, imp.: N. act or operation of covering a surface with a thin film of silver, or with an amalgam of tin and mercury; the silver or amalgam laid on (for silvering of glass, see MIRROR). SIL'VERED, pp. *-vĕrd.* SIL'VERY, a. *-vĕr-ĭ*, having the appearance of silver; of mild or silver-like lustre; clear and soft as the sound of a silver bell; covered with silver. SILVER-BEATER, one who beats pieces of silver into thin leaves. SILVER-FIR, fir-tree, native of middle and s. Europe; the *Picĕa pectināta*, or *Abĭēs picĕa*, ord. *Conifĕræ.* SILVER-FISH, fish of the size of a small carp, of white color, striped with silvery lines. SILVER-GLANCE, mineral of blackish lead-gray color, being a sulphide of silver. SILVER LINING, the prospect of better and happier days, as in the proverb, 'every cloud has its silver lining.' SIL'VERSIDE, n. in *cook.*, the lower and choicer part of the buttock or round of beef, tender and close in grain; it is frequently corned. SILVERSMITH, one who works in silver. SILVER-STICK, n. the name given in England to a field-officer of the life guards when on palace duty. SILVER-WEED, roadside plant; *Potentilla anserīna*, ord. *Rosācĕæ.* SILVER WEDDING, 25th anniversary of the wedding-day. FULMINATING SILVER, explosive compound prepared from the oxide of silver and ammonia. GERMAN SILVER: see under GERMAN. TO BE BORN WITH A SILVER SPOON IN ONE'S MOUTH, to be born to good fortune; to be born under favorable auspices.

SILVER (symb. Ag, at. wt. 108, sp. gr. 10·53): metal which, in its compact state, is of brilliant white color, has the metallic lustre to a remarkable degree, is capable of being highly polished, and evolves a clear ringing sound when struck. It is harder than gold, but softer than copper, and is one of the most ductile of metals. It is malleable, may be hammered into very thin leaves, and may be drawn out into very fine wire, the thinnest S.-leaf having a thickness of only $\frac{1}{100000}$ of an inch, and one grain of the metal being capable of yielding 400 ft. of wire. It has a high degree of tenacity, a wire of diameter of $\frac{1}{12}$ of an inch being able to support a weight of nearly 188 lbs. It requires a heat of 1,873°F. to fuse it, and on cooling expands at the moment of solidification. It is probably the best conductor of heat and electricity known, and is not affected by exposure even to a moist atmosphere at any temperature. When, however, it is fused, it absorbs considerable oxygen; which it expels in the act of solidification with a peculiar sound, technically know as *spitting.* Though ordinary air has no oxidizing action on S., ozonized

air rapidly attacks it. But though it does not rust or become oxidized, it usually becomes tarnished on prolonged exposure to the air, owing to the formation of a film of sulphide (or sulphuret) of S.; and this change occurs more rapidly in towns than in the country, because sulphuretted hydrogen is more abundant in the atmosphere. S. is unaffected by the hydrates or nitrates of the alkalies, even at high temperature; hence S. crucibles, etc., are highly useful in many laboratory operations.

Hydrochloric and dilute sulphuric acid have scarcely any action on S., but nitric acid and boiling sulphuric acid oxidize it, and form salts; nitric acid being by far its best solvent. S. has strong affinities for chlorine, bromine, iodine, and sulphur; and combines with the first three and sulphuretted hydrogen at ordinary temperatures. It is well known that sodium chloride or common salt, especially in the melted state, when left for any time in contact with silver, corrodes that metal, soda being formed by combination of the sodium with the oxygen of the air, while the liberated chlorine attacks the silver.

S. is frequently found in the native state, crystallized in cubes or octahedrons, or occurring in fibrous masses. It is found also in combination with gold, mercury, lead, antimony, arsenic, sulphur, etc.; and sulphide of lead is almost always accompanied with more or less sulphide of S.; it is, however, never found as an oxide.

S. forms three compounds with oxygen—viz., monoxide, or argentic oxide, Ag_2O; argentous oxide, Ag_4O; and dioxide, Ag_2O_2; of these only the monoxide is a well-defined compound: they all have the common properties of being reduced by heat to the metallic state, and of being readily decomposed by action of light. The monoxide is a dark-brown heavy powder, devoid of taste or smell, somewhat soluble in water, to which it communicates metallic taste and alkaline reaction. It acts as a powerful base, neutralizing the strongest acids, and forming normal salts with them. It is obtained by addition of a solution of potash to a solution of the nitrate or any other soluble salt of S., falling as a hydrated oxide, which, at a temperature above 140°F., becomes anhydrous. If a concentrated solution of ammonia be digested for some hours upon freshly precipitated argentic oxide, Fulminate of Silver (q.v.), or Fulminating S. in the form of a black powder is produced, and the same dangerous compound is formed when an ammoniacal solution of nitrate or chloride of S. is precipitated by potash.

The salts which the monoxide forms with acids are characterized by the readiness with which they decompose—the mere action of light blackening and partially reducing them. None of these salts occur in nature. The following are the most important of those formed artificially.

Nitrate of Silver, $AgNO_3$, crystallizes in large, colorless, transparent square tablets, which blacken on exposure to light, or in contact with organic matters, owing to reduction; and dissolve in their own weight of cold or half their weight of boiling water. This property of producing a

permanent black color with organic matters has led to its employment as a *marking ink* * for linen, etc. The black stains which it forms on the skin, on linen, etc., are metallic silver: it may be removed by a strong solution of iodide of potassium, or more readily by a solution of cyanide of potassium. The crystals fuse at a temperature of about 425° F., and the molten mass, cast into cylindrical molds, solidifies, and forms the sticks of *lunar caustic* used in surgery, medicine, and Photography (q.v.). Nitrate of S. is prepared by dissolving pure S. in moderately strong nitric acid, and evaporating till the solution is sufficiently concentrated to crystallize. 'The most characteristic test for the salts of S. is the action of hydrochloric acid, or of a soluble chloride, which produces a white curdy precipitate of chloride of S., insoluble in nitric acid, but readily soluble in ammonia; it is soluble also in hyposulphite of soda, with which it forms an intensely sweet solution; cyanide of potassium also dissolves it; the chloride of S. speedily assumes a violet tinge when exposed to light.'—Miller's *Elements of Chemistry*, 2d ed., II. 732.

Of the haloid salts of S., several occur native. The most important of these compounds is *monochloride*, or argentic chloride, $AgCl$, or rather Ag_2Cl_2, found native either in cubes or in a dense semi-transparent mass, and known as *horn silver:* it may be procured as a dense white flocculent precipitate by the procedure described in the preceding paragraph. For its sensibility to light, it is used in photography. When heated to about 500° F. it fuses into a yellow fluid, which, on cooling, solidifies into a yellowish gray semi-transparent horny mass. This salt is insoluble in water and in all the diluted acids, but dissolves in a solution of ammonia, from which it crystallizes in octahedra. Its solution in a solution of sodium hyposulphite is used in silvering iron, copper, and brass goods. Traces of this salt are found in sea water, the chloride of sodium probably acting as the solvent. *Bromide of Silver*, $AgBr$, or Ag_2Br_2, is found in Chili and Mexico, where it is known as *Plata verte*, or green S., in the form of small crystals or crystalline granules of pale olive green tint. *Iodide of S.*, AgI, or Ag_2I_2, occurs native in several Mexican mines in the form of thin, flexible, pearly scales.

Sulphide (or *sulphuret*) *of silver*, Ag_2S, is the principal ore of S. It occurs native, sometimes crystallized in cubes or octahedra, sometimes in masses. From its gray metallic lustre it has received from mineralogists the name *silver glance*. It is well known that if S. spoons are allowed to remain in contact with boiled eggs for some

* Brande gives the following directions for preparing marking ink: Dissolve two drams of nitrate of silver and one dram of gum-arabic in seven drams of water, and color the liquid with Indian ink. The cloth must be first prepared by moistening the spot with a few drops of a soda solution, prepared by dissolving two ounces of crystallized carbonate of soda and two drams of gum in four ounces of water. Prof. Miller recommends, as a cheap indelible marking ink, a solution of coal-tar in naphtha; it resists the action of chlorine, and is used by bleachers to mark their goods.

time, they become tarnished by the action of the sulphur, a minute quantity of sulphuretted hydrogen being probably evolved. The discoloration is easily removed by washing the darkened S. with a solution of cyanide of potassium. Sulphide of S. unites with various other metallic sulphides when fused with them, especially with the sulphides of arsenic and antimony. *Red silver ore*, or *pyrargyrite*, $AgSbS_3$, is a native compound of this kind.

The alloys of S. and copper (see ALLOY: MINT), when cast into ingots, are usually found to differ in their composition in the internal and external parts, in consequence of a molecular change, 'liquation,' during the cooling and slow solidification of the molten mass. In bars containing more than 719 parts of S. in 1,000, the central portions are richer in S. than the exterior; in alloys of less value, the reverse is observed; while in ingots containing 950 or more parts of S. in 1,000, the composition is nearly uniform throughout. When exactly 719 parts of S. and 281 of copper are combined (corresponding to the formula Ag_3Cu_2), no separation whatever of the metals occurs. Many metals, as tin, zinc, antimony, bismuth, arsenic, etc., when mixed with S., render it brittle and unfit for its ordinary uses; they are, however, easily removed in the process of refining. An alloy consisting of five parts of S., six of brass, and two of zinc, is used as a solder for S. An alloy of S. and mercury, known as *silver amalgam*, occurs native in a crystallized form; being found in Hungary, Sweden, Spain, Chili, and elsewhere: it consists of S. 34·8 parts, mercury 65·2. It is a mineral of silvery white color.

S., like gold, has been known and prized from the earliest ages. The S. mines of Mexico were, until recently, by far the richest known. Their estimated annual yield is about 1,600,000 lbs. troy of the pure metal. Until the remarkable discoveries of silver ore in Nevada, Arizona, Colorado, New Mexico, Utah, and Montana, dating from 1859, Chili and Peru had long stood next to Mexico in their yield, each furnishing about one-sixth of the produce of that country. Bolivia also is rich in S. The S. product of the United States 1858 was $500,000; (1861) $2,000,000; (1871) $23,000,000; (1881) $43,000,000; (1901) $71,387,800; the S. product of the world 1901 was estimated $235,000,000.

Of European countries, Spain is most productive, the richest mines being those of Hiendelaencina, province of Guadalaxara, extensively opened 1846. These have yielded immense wealth, but their produce has much declined since 1858. S. glance is the principal ore, though several others are found, including quantities of the formerly rare mineral freieslebenite, which contains about 23 per cent. of S. Next to Spain, Austria, Saxony, and the Harz district in n. Germany, yield largest supplies. The S. mines of Kongsberg, in Norway, likewise are valuable, and have been long famous. Great Britain has no S. mines, properly so called; but since the introduction 1829 of Pattinson's process for the desilverizing of lead smelted

from argentiferous galena, a large quantity has been annually produced in this way (see LEAD).

The forms in which S. is found in nature are numerous; we need notice only a few of them. It is frequently found native in crystallized and amorphous masses, sometimes of considerable size: one fine piece of 500 lbs., found at Kongsberg, is now in the Copenhagen Museum. Specimens of native S. are found often with native copper in the Lake Superior mines, also in the S. mines of Nevada, etc.; but these are of no great size. On the whole, the quantity of S. found in nature in the metallic state is comparatively small. Its principal ores are the various sulphides or sulphurets—viz., S. glance, or sulphuret of S., containing when pure about 87 parts of S. and 13 of sulphur; brittle S. ore, or sulphuret of S. and antimony, whose composition is, S. 68·5, antimony 14·7, sulphur 16·4; and red S. ore, of which there is a dark and a light kind, the composition of the former similar to brittle S. ore, but it is a little less rich in S., and the latter differs only in containing arsenic instead of antimony. The bulk of the S. obtained in Mexico and S America is from these ores. The only other of much importance, except the mixed ores noticed below, is horn S., or chloride of S.: in a pure state, it consists of S. 75, chlorine 25. It occurs extensively in Mexico and Peru, and in certain districts of Nevada and Idaho; but is not common in European mines.

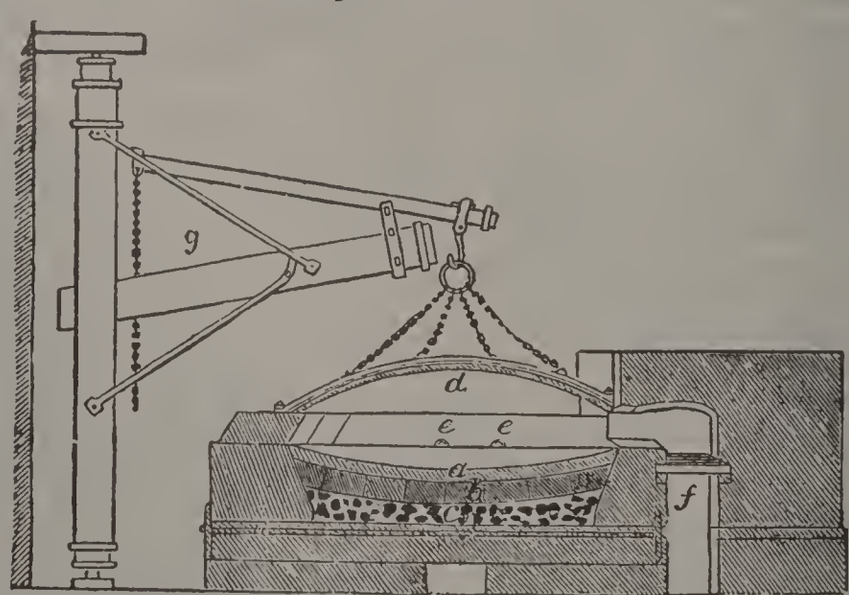


Fig. 1.—Silver Cupellation Furnace.

a, sole formed of wood ashes; *b*, bricks; *c*, bed of slag; *d*, dome of iron plate; *ee*, tuyères for bellows; *f*, fireplace; *g*, crane for lifting dome.

Besides the ores named above, a good deal of the S. of commerce is obtained from mixed ores; i.e., the ores of other metals are frequently found to contain it. In many cases, the amount of S. falls greatly short of 1 per cent. These ores are mostly sulphurets of lead, arsenic, copper, zinc, and iron.

In reduction of S. ores, the processes followed are based on the fact, that both lead and mercury have strong affinity for S. A more recent process depends on the solubility of chloride of S. in a hot solution of common salt, and its separation again on cooling.

The simplest process is ordinary smelting, and is applied only to the richest ores: these are crushed, mixed with old slag, lead in some form, and a little iron ore and lime. The mixture is then heated in a furnace with charcoal, which brings down the S. and lead together as an alloy. The S. is afterward easily separated by cupellation, for whose principle see ASSAY; but on the large scale, instead of a small bone ash cupel, a cupellation furnace, say 6 ft. in diameter, is used, of which fig. 1 is a section. Here the alloy is melted, bellows are used to remove the lead as litharge, or oxide of lead, and a cake of S. is left on the cupel forming the bottom of the furnace.

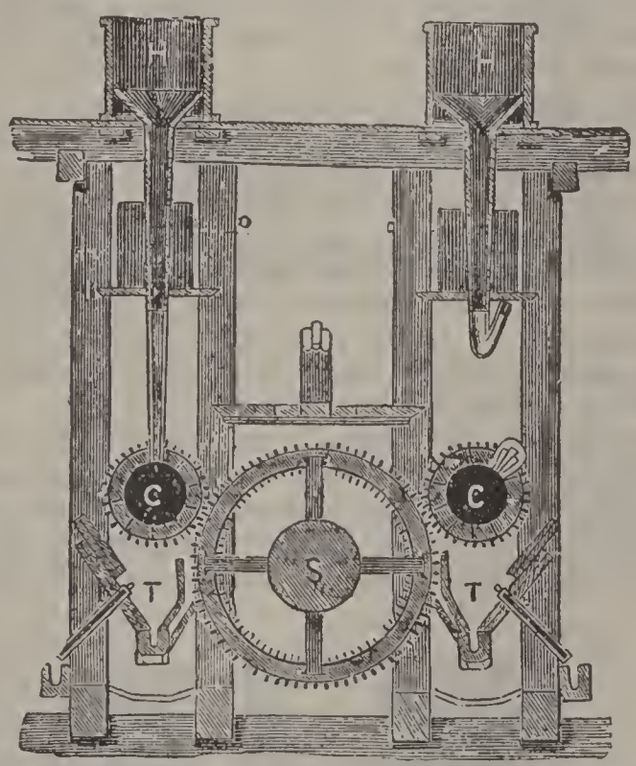


Fig. 2.—Vertical Section of Amalgamating Apparatus:
CC, oak barrels; S, toothed wheel for setting barrels in motion; H, hoppers with hose for passing the mixed ore into the barrels; TT, troughs for the reception of the charge when the amalgamation is complete.

It happens that not many even of the richer ores are pure enough to be treated with advantage by simply roasting them with lead; accordingly, another plan, the amalgamation process, is more usual. The following is an outline of the way in which this is (or rather was) practiced at Freiberg in Saxony; the same process, with modifications, is employed in Nevada, Idaho, etc., for reducing the richer ores. The vein stuff (largely silica) containing a mixed ore of lead, copper, zinc, etc., as sulphurets, and only from 3 to 3½ oz. of S. per cwt., is ground to powder, as described under METALLURGY; but some sulphuret of iron also is pres-

ent or must be added. About 10 per cent of common salt is then mixed with the ore, and the mixture heated in a Reverberatory Furnace (q.v.) to a temperature sufficient to expel water, and in part arsenic, zinc, and antimony. After two hours, the sulphur of the sulphurets takes fire, and is burned off as sulphurous acid, or converted into sulphuric acid, so that the metals become oxides and sulphates. The temperature of the furnace is now raised, when the chlorine of the common salt forms volatile chlorides with zinc, antimony, and iron, and a fixed chloride with S. During the roasting, the contents of the furnace are continually stirred, so that they ultimately form a coarse powder.

The product of the roasting furnace, after being ground to fine powder, is mixed in the proportion of 10 cwt. with 3 cwt. of water and 1 cwt. of iron in fragments; the mixture being effected in oak casks, which are then made to revolve two hours on their axes: see figs 2 and 3. During the operation the iron decomposes the metallic chlorides in the roasted ore, forming chloride of iron, while the copper is partly reduced to sub-chloride and partly to metallic copper. If there is not enough iron present to convert the copper into sub-chloride, then mercury will be wasted in the next stage by conversion into its sub-chloride. Quicksilver to the amount of 5 cwt. is next run into each of the casks, which are then set in motion, and continue 22 hours at the rate of 12 revolutions per minute. The result of this is, that the S. being precipitated by the presence of metallic copper, is then dissolved by the mercury, but the amalgam so formed is usually a complex one.

To separate the amalgam from the earthy matters and the sulphates and chlorides, the barrels, hitherto only two-thirds full, are filled with water (the dilution throwing down any chloride of S. held in solution by the sea-salt), and kept revolving two hours; after which, by means of a

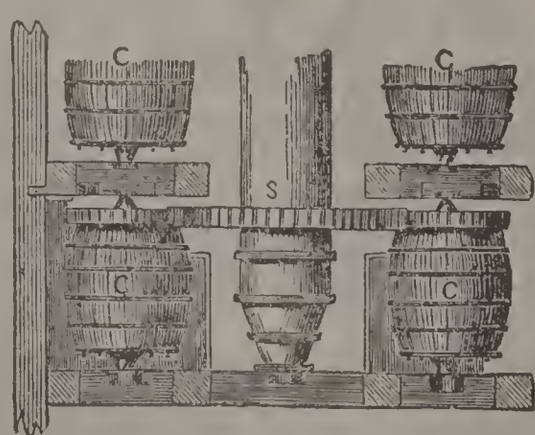


Fig. 3.—Plan of Part of Amalgamating Apparatus.

stop-cock, the amalgam is allowed to flow into the amalgam chamber, and the rest of the contents, except the iron fragments, into a wash-tun. The superfluous quicksilver has next to be separated from the amalgam. This is done in bags of ticking, through which the mercury at first flows

readily by its own weight, and is afterward squeezed out on a flat surface. The result of this operation is that the amalgam of mercury, S., copper, etc., is left in the bags: its actual composition being nearly 85 per cent of mercury, 10 per cent of S., and 5 of copper, lead, and antimony. Finally, the quicksilver of the amalgam itself is separated by heat in the distilling furnace, fig. 4. Here th amalgam

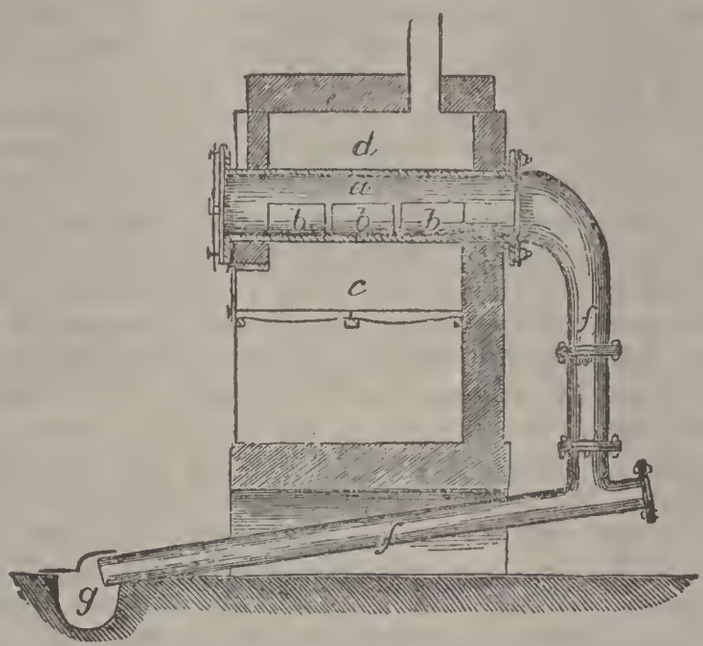


Fig. 4.—Furnace for Distilling the Amalgam:
a, iron retort; *b*, iron pots; *c*, fireplace; *d*, flue; *f*, condensing pipe. *g*, trough for collecting mercury.

is put into a row of iron pots, which go into a large retort. When heat is applied, the quicksilver volatilizes, and is condensed in a pipe attached to the retort, from which it is collected in a trough. The impure S. left in the retort is refined by fusion and subsequent cupellation.

Another process has been used at Freiberg and elsewhere, by which the use of mercury is dispensed with. It consists in treating the ore as above described till it leaves the roasting-furnace. At this stage, the roasted ore is digested in a warm concentrated solution of sea-salt, which readily dissolves the chloride of S. The solution is then passed through wooden tubs containing metallic copper, which has the property of decomposing the chloride of S.: the chlorine unites with the copper to form chloride of copper, and the S. is precipitated. This process is now mostly abandoned; and at Freiberg an argentiferous copper matt obtained in smelting mixed ores is treated with sulphuric acid, by which sulphate of copper is formed, and the S. recovered from the residue. Of late years, Crookes's sodium-amalgam process has been used with advantage for extraction of S. in several American mining districts (see SODIUM-AMALGAM)

In Mexico, the ore containing small quantities of sulphide and chloride of S. is stamped or ground, together with water, in mills worked by horses or mules, and the fine mud thus produced is mixed on a floor with 3 to 5

per cent. of common salt by being trodden by mules. The mass is allowed to stand 24 hours, after which mercury is added, together with 'magistral,' an impure mixture of salts of iron and copper; then more mercury, and again the mass is trodden. Amalgamation having been completed, the slimy mass is washed in buddles worked by mules, whereby the lighter particles are washed away, and the heavier amalgam deposited. The amalgam is now filtered through canvas bags, and finally distilled; the silver left behind is melted into bars.

The physical and chemical properties of silver are such as make it specially valuable for many purposes in the arts: see ALLOY: MINT: PLATING: GALVANISM: ELECTRICITY (*Electroplating*): PHOTOGRAPHY. Ordinary mirrors have their *silvering* produced by a coating of an amalgam of tin and mercury; but for some years mirrors coated by a patent process with real silver, and backed by a layer of some composition which protects it from the blackening action of sulphuretted hydrogen, have been made in great numbers.

The world's production of silver in 1907 amounted to 184,948,867 troy ounces, valued at $122,090,000. The United States that year led the world in silver production, and Mexico and the United States together produced nearly 70 per cent of the total output. The principal silver-producing countries are as follows: Mexico, United States, Australasia, Bolivia, Spain, Germany, Canada, Peru, Colombia, and Japan.

With the exception of the years 1895 and 1902, when Mexico was first, the United States has led the world in silver production for over 30 years. Of the continents North America is easily first, with Europe now second. The chief silver-producing states of the Union are: Colorado, Montana, Utah, Idaho, Nevada, Arizona, and California.

Uses of Silver.—Silver is used for coinage and for ornamental articles, while the chloride, bromide, and iodide of silver are of great importance from their use in photography. Articles plated with silver are in common use, as the cost of plating is small if the film of silver deposited is thin. A solution of the double salt potassium silver chloride (KCN.AgCN) is used, from which the silver is readily deposited. The articles to be plated are thoroughly cleaned, attached to the negative pole of an electrical circuit of low voltage and immersed in the bath, a silver plate being attached to the positive pole. The silver as deposited has a dead surface but is made bright by burnishing after removal from the bath.

In photography silver chloride in a layer of albumen or gelatine is used on the ordinary printing papers; various organic compounds are formed which are changed on exposure to light, and this change is shown by the action of certain reducing agents, developers, the resulting image being formed of unknown silver salts sus-

pended in the gelatine. In bromide prints which are more durable, the image is due to finely divided metallic silver. In the ordinary photographic dry plates, silver bromide or iodide is used in a gelatine film, as these salts are more easily affected by light.

The following is a brief summary of silver legislation in the United States:

1652—First mint established in Boston, closed in 1688.
1785—Congress adopted the Spanish milled dollar as unit of value.
1792—First United States mint established, and silver dollar of 371¼ grains pure silver made the standard; ratio to gold, 15:1.
1834-37—Value of gold coins reduced (silver dollar remaining the same) to make the ratio 15-988:1.
1873—Silver dollar dropped from coinage.
1878—Bland-Allison act providing for coinage of $2,000,000 per month.
1890—Sherman law passed providing for purchase of 4,500,000 oz. silver bullion per month.
1893—Sherman law repealed.

See Money: Mint: Gold: Currency: Bimetalism.

SILVER, Free Coinage of: During the presidential election campaign of 1896 for the first time in the United States the free coinage of silver became an issue of national importance. The wide circulation of *Coin's Financial School* (a popular plea for silver) and the debate on the question in congress preceding the campaign had prepared the people for the question. Briefly, the proposition is that the U. S. government purchase and coin all silver offered at the present established ratio of nearly sixteen ounces of silver to one ounce of gold. The advocates of the plan call attention to the fact that this has been the policy of the United States from the beginning till 1873, when silver was demonetized. Silver, it is claimed, was the standard of values adopted by the first coinage act of 1792, and the silver dollar has remained of the same weight of pure silver, while the weight of the gold dollar has been changed to a lighter weight 1834, and to a slightly heavier weight 1837. After silver was demonetized its advocates say it has still remained the standard of values, while gold has risen in value, thus forcing lower prices for the producer's goods, and at the same time compelling him to pay his debts with the enhanced currency, which costs him twice as much labor to obtain.

Those who oppose free coinage say that the fall in prices has been due to increased cheapness and abundance of production; that gold has not risen in value, but silver has fallen because it also has become vastly more abundant and can be produced with less labor than formerly; that it was this very fall in the commercial value of silver which forced the United States and other nations to close their mints to its coinage or to restrict its use.

Gold advocates point to the enormous increase in pro-

duction of silver since 1873, which has averaged 96,000,000 ounces a year, against only 35,000,000 ounces a year 1848-73, and only 21,000,000 ounces a year for the first 48 years of the century. This increase in production, they say, is sufficient to account for the decrease in price. But the silver advocates call attention to the enormous increase in the production of gold, which has risen from about 700,000 ounces a year during the first half of the century to over 5,000,000 ounces a year since the discovery of gold in California and Australia. From 1848-73, as they point out, the annual production of gold had increased seven-fold, while the production of silver was only a half greater. Yet while the productive ratio of silver to gold was only 6.64 to 1, the commercial ratio, which was the price of silver in the open markets of the world, was 15.48 to 1, or practically the same as for the half century before. That silver fell in price after 1873, as measured in gold, was due, they say, not to its increased production, but to its demonetization, which largely restricted the demand for it and at the same time increased the demand for gold. The ratio of production of silver and gold, they say, has been no greater since 1873 than for the 200 years prior to this century, when the commercial ratio remained practically constant. To the 'crime of 1873' in the demonetization of silver and the subsequent steady fall in values, the silver men ascribe the cause of all recent financial ills, and insist that the cure can come only by restoring silver to its old position.

Here the gold advocates take sharp issue. They say that even granting that demonetization of silver has caused its fall in price (which they do not grant), to return to free coinage of silver would not better matters. The country would be flooded with silver dollars, which as bullion could be purchased in the open market at about 50 cents on the dollar. This would mean a 50-cent dollar with which to transact business and pay debts—hence the campaign cry of the 'dishonest dollar.' The silver advocate either denies that the 'cheaper dollar would drive out the dearer' and give a silver basis, or else frankly admits its truth and appeals to the debtor class for its support.

A middle ground is held by the international bimetalists—that while the United States alone cannot without injury adopt free coinage of silver, that move could be taken with safety in conjunction with the other leading commercial nations of the world. Such agreement they hold would immediately restore the old commercial ratio between the two metals, which would remain approximately the coinage ratio, and so remove all risk of a cheaper currency. This would enlarge the solid money basis, and so make easy and safe an increase in the volume of paper currency, with a consequent easing of the money market, causing a stimulation of prices and wages and an increased demand for the products of industry.

SILVER AGE: the designation applied to the second mythological period in the history of the world, under the care of Jupiter. It succeeded the Golden Age. The phrase is also applied to a period of Roman literature succeeding the most brilliant period, and extending from about 14 A.D. to 180 A.D.

SILVERSIDE: a name given to various small fishes because of their bright silvery color and especially to members of the family *Atherinidæ* of the order *Percesoces*. These fishes have the third upper pharyngeal bone enlarged, slender and elongated bodies with rather large, easily detached cycloid scales. The spinous dorsal fin is weak and well separated from the soft dorsal, the ventral fins are on the middle of the abdomen and the pectorals at a high level. Most of them are small carnivorous fishes living in schools in shallow bays of the sea, but a few are fresh-water. They are important chiefly as food for other fishes, but several of the larger ones are valued as human food. Fifteen genera and 60 species have been enumerated, most of which are North American. They abound especially in the Gulf of Mexico. *Menidia notata* is the form best known along the coast of the New England and middle states, where it abounds. It is a delicate, translucent little fish of a greenish color, has a conspicuous lateral silvery band, and is found everywhere along the shores in large schools. They may be fried to a crisp and eaten whole like smelts. The brook or lake silverside (*Habidesthes sicculus*) is found abundantly in ponds and sluggish streams throughout the Mississippi valley and southern states, and is often called skipjack.

SILVES'TER, Pope of Rome. See SYLVESTER.

SI'MA. See CYMA.

SIMAR, n. *sĭ-mâr'*, or SIMAR'RA, n. *-ră* [mid. L. *samarra*]: sack-like robe, painted with devils, flames, etc., in which the victims of the Inquisition were burned; a robe like it.

SIMARUBACEÆ, *sĭm-a-rô-bā'-sē-ē:* natural order of exogenous plants, consisting of trees and shrubs; with alternate, generally compound leaves, without stipules; regular, generally hermaphrodite flowers. The species are not numerous; they are found in tropical Asia, Africa, and America. The whole order is characterized by great bitterness, and several of the species are used as tonics in dysentery, etc. Quassia and Bitterwood belong to it.

SIMBIRSK, *sĭm-bērsk':* government in Russia, bounded e. by the Volga, w. by the governments of Nijni-Novgorod and Penza; 19,050 sq.m. The surface is mostly level, and the soil of remarkable fertility, and there are excellent and extensive meadows and pasture-grounds. The fisheries and the commerce on the Volga, and cattle-breeding, are important. Pop. 1,579,847.

SIMBIRSK′: town, cap. of the Russian government of Simbirsk; on the right bank of the Volga, 220 m. s.e. Quebec. At the age of 18 Simcoe entered the army as ensign, and during the American revolution he raised and commanded a battalion called the Queen's Rangers, which did good service for the loyalists. He was in the battles of Nijni-Novgorod. Leather, soap, and candles are manufactured, considerable trade is carried on by the Volga, and there is a famous annual fair. Simbirsk suffered severely from fires 1864 and 5. Pop. 39,047.

SIMCOE, *sĭm′kō,* JOHN GRAVES: British soldier: 1752, Feb. 25—1806, Oct. 26; b. near Exeter, England. His father, a captain in the navy, was killed at the siege of of Brandywine and Monmouth, and was wounded on both occasions; was included in the capitulation of Cornwallis at Yorktown; 1790 was promoted colonel, 1794 major-general, and 1798 lieutenant-general. From 1791-94 he was governor of Upper Canada; and during his administration was charged with encouraging Indian hostilities against the United States. He was governor and military commander of San Domingo 1796-7.

SIMCOE, *sĭm′kō,* LAKE: in Ontario, Can., between Lake Ontario and Georgian Bay; greatest length, 30 m.; greatest width 18 m.; 170 ft. above Lake Huron, into which it discharges its waters through Lake Couchiching, the Severn, and Georgian Bay. It contains many islands, some inhabited by Indians; and it abounds in excellent whitefish. Its banks are covered with trees. It was named after Gen. Simcoe, as were the county and town of the same name.

SIMEON, *sĭm′ĭ-on,* CHARLES: notable evangelical preacher of the English Church: 1758, Sep. 24—1836, Nov. 13; b. Reading, Berkshire. Educated at Eton and Cambridge, he was ordained a priest 1782. His first religious impressions occurred during his residence at the university, and produced a permanent change in his character. From a somewhat vain and light-minded youth, he passed into an ardent and zealous preacher of the strictest evangelical doctrines and precepts; and this he remained during the 54 years of his public ministry. Appointed vicar of Trinity Church, Cambridge, 1782, and vice-provost of his own college (King's) 1790, he held these offices through life. As a preacher, Simeon was distinguished for impassioned evangelicalism in language, sentiment, and doctrine, which soon roused a bitter and protracted opposition. His earnestness, however, met its due reward. Friends and followers sprang up; and in course of time Simeon became a centre of evangelical influence, that began to spread itself over the whole church, and gave birth to its great foreign missionary activity in recent years. Simeon may even be regarded as the founder of the 'Low-church' party; and on the whole fairly represents their earnestness, dogmatism,

and their grade of intellect and scholarship. For an account of Simeon's life and labors, see *Memoirs of the Rev. Charles Simeon*, by the Rev. W. Carus (Lond. 1857). Simeon's *Horæ Homileticæ* (21 vols. 1832) are very popular among sermon-readers and sermon-makers of evangelical tendencies.

SIM'EON STYLI'TES. See PILLAR SAINTS.

SIMFEROPOL, *sĭm-fĕr-ō'pŏl:* town of Russia, in the Crimea, capital of the government of Taurida; on the Salghir, 45 m. n.e. of Sebastopol. The valley of the river is studded with charming villas, and the town is surrounded by gardens, and has a picturesque appearance. The older part comprises the old Tartar town of Ak-Metchet, or White Mosque: the new part, containing the government buildings, is very handsome. Fruits are largely grown in the vicinity, and exported. Pop. 36,503.

SIMIA, n. *sĭm'ĭ-ă* [L. *simĭa,* an ape—from L. *simus,* Gr. *simos,* flat nosed: It. *simo,* flat-nosed]: an ape; the systematic name for apes and monkeys (see MONKEY): plu. SIM'IÆ, *-ĭ-ē.* SIM'IOUS, a. *-ŭs,* or SIM'IAN, a. *-ĭ-ăn,* or SIM'IAL, a. *-ĭ-ăl,* pertaining to or resembling a monkey or ape; having the character of an ape.

SIMILAR, a. *sĭm'ĭ-lĕr* [F. *similaire;* It. *similare,* similar—from L. *simĭlĭs,* like]: resembling; having a like form or appearance; like in quality. SIM'ILARLY, ad. *-lĭ.* SIM'ILAR'ITY, n. *-lăr'ĭ-tĭ,* likeness; resemblance.

SIMILAR FIGURES, in Geometry: figures which exactly correspond in shape, but may or may not be of the same size. If the figures be rectilineal, then the criterion of similarity is that every pair of corresponding sides have the same ratio to each other, and that each angle of the one figure be equal to a corresponding angle of the other. If the figures be triangular, the proportionality of the sides carries with it the equality of the angles, and *vice versâ,* but only in this case. *Similar segments* of circles are those in which, and on bases, similar triangles can be inscribed; or, as it is otherwise expressed, those which contain equal angles—a satisfactory test that they are each the same part of their respective circles. *Similar solids* are those bounded by similar planes similarly situated to each other. All similar plane figures are to one another as the squares of any corresponding sides, and all similar solids are as the cubes of their corresponding sides. Thus, a circle which has 3 (3 : 1) times the diameter of another, has 9 ($3^2 : 1^2$) times its area, and a globe which has 3 (3 : 1) times the diameter of another has 27 ($3^3 : 1^3$) times the volume.

SIMILE, n. *sĭm'ĭ-lē* [L. *similis,* like: It. *simile,* like]: a common figure of speech, in which two things which have some strong point or points of resemblance are compared. SIMILITUDE, n. *sĭ-mĭl'ĭ-tūd* [F.—L.]: likeness in qualities or appearance; resemblance; comparison; simile.

SIMILITER, ad. *sĭ-mĭl'ĭ-tėr* [L. *simĭlĭter,* in like manner]: in *law,* a form in pleading in which either party accepts the issue tendered by the other.

SIMILOR, n. *sĭm'ĭ-lŏr* [F.—from L. *similis,* like; *aurum,* gold]: an alloy of red copper and zinc to imitate gold: also SEMILOR.

SIMMER, v. *sĭm'mėr* [Dan. *summe;* Ger. *summen;* Sw. *summa,* to hum; an imitative word]: to boil gently or with a suppressed hissing noise. SIM'MERING, imp. SIM'MERED, pp. *-mėrd.*

SIMMONS, or SYMMONS, n. plu. *sĭm'mŏnz* [Icel. *sime,* a slender rope]: in *n. of Scot.,* ropes made of heath.

SIMMS, *sĭmz,* WILLIAM GILMORE: author: 1806, Apr. 17—1870; b. Charleston, S. C.; of Scotch-Irish extraction. He made verses at the age of seven; and during the war of 1812 celebrated in rhyme the exploits of the American army and navy. Left in charge of his grandmother at Charleston, he was placed with a druggist; but at 18 began the study of law; was admitted to the bar at 22; published *Early Lays* and *Lyrical and Other Poems* (1827); and became (1828) editor of *The City Gazette,* and published *The Vision of Cortes, Cain, and Other Poems* (1829), and *The Tri-Color,* poetical glorification of the French Revolution (1830). In 1832, his paper, opposing nullification, failed; and he lost his wife, father, and grandmother, and took refuge in New England, where at Hingham, Mass., he wrote his best poem, *Atalantis, a Story of the Sea* (1833); and the same year, *Martin Faber,* the story of a criminal. From this time, he poured out poems, novels, histories, and biographies in rapid succession. His works, other than poems and novels, comprise a *History of South Carolina; South Carolina in the Revolution; Lives* of Gen. Marion, Capt. John Smith, Chevalier Bayard, Gen. Greene; *Civil War in the South; American Loyalists of the Revolution; Views and Reviews of American Literature; The Morals of Slavery,* etc. Residing in South Carolina during the war of secession, he sustained the southern cause in a weekly newspaper, and had his house and library wrecked by federal soldiers.

SIM'NEL, LAMBERT: English imposter and pretender to the throne; b. Oxford about 1472. While a boy he was trained by a priest, one Richard Simon, to personate the claims of the York faction early in the reign of Henry VII. In 1847 he gave himself out as Edward, Earl of Warwick, son of Clarence, and sole heir of the house of York. He was crowned at Dublin as Edward VI. Supported by troops furnished by malcontent nobles he landed in England, but was defeated a few days later at Stoke. Henry imprisoned Simon for life, but gave Simnel a place in the scullery and afterward made him falconer.

SIMON, *sē-mōng'*, JULES (JULES FRANÇOIS SIMON SUISSE): French philosopher and statesman: b. Lorient, 1814, Dec. 31. For some years a teacher and lecturer, he succeeded Cousin 1839 in the chair of philosophy at the Sorbonne, which he occupied until forced to resign because of his opposition—as member of the constituent assembly—to the *coup d'état* 1851. He was elected to the legislature 1863 and 69. After the republic was restored, 1871, he was minister of education and religion under Thiers two years, when he returned to the national assembly. In 1875 he was pensioned, 6,000 francs, and chosen senator for life and mem. of the Acad. At this time he led the republican 'left,' and was its most frequent and eloquent speaker. He was commissioned by Pres. MacMahon to form a new cabinet 1876, Dec., of which he was pres., with the portfolio of the interior, and declared himself conservative republican. He tried to conciliate the clerics by interdicting Père Hyacinthe, and, on the other hand to prosecute the anti-republican Cassagnac; but the cabinet had to resign 1877, May 17, in favor of the reactionists. He upheld the 'centre,' and was opposed alike to the commune and the monarchists, resisting the amnesty 1880. He demanded the recognition of God (1881) in school instruction and the laws, and (1884) spoke against divorce. S. was director and collaborator of leading journals. Among his numerous books are *Duty* (1854); *National Religion* (1856); *Liberty of Conscience* (1859); *Liberty*, two vols. (1859); *The School* (1864); *Labor* (1866); *Radical Politics* (1868); *God, Country, and Liberty* (1883); *Opinions and Speeches* (1888). He d. 1896, June 8.

SIMON, *sī'mon*, RICHARD: orientalist and critical scholar: 1638, May 13—1712, Apr.; b. Dieppe. Having completed his studies, he entered the Congregation of the Oratory 1659, but soon withdrew, returning, however, 1662. Eventually he turned his studies to theology, oriental languages, and biblical criticism. While a member of the Oratory he published his well known work on the doctrine of the oriental church regarding the Eucharist, designed as a supplement to the celebrated *Defense of the Perpetuity of the Faith in the Blessed Eucharist*, by Arnauld and Nicole, but criticising that work severely. This and other controversies led to his again withdrawing from the Oratory 1678, retiring to Belleville as curé; but 1682 he resigned his parish, and lived in literary retirement, first at Dieppe, afterward in Paris. In failing health he returned to Dieppe, where he died. Few writers of his age were so prominent in the world of letters, especially in its polemics. There is scarcely a critical or theological scholar among his contemporaries with whom he did not break a lance—Spanheim, Le Clerc, Du Pin, Jurieu, and Jurieu's great antagonist, Bossuet. His principal work is *Histoire Critique du Vieux Testament* (Paris 1678), in which he anticipates the most important conclusions of the later rationalistic scholars of Germany, also their method of investigation; e.g., he conceives himself to have disproved the Mosaic authorship of the Pentateuch, and assigns its composition

to the scribes of the time of Ezra. Other writings of S. are *Histoire Critique du Texte du Nouveau Testament* (Rotterd. 1689); *Disquisitiones Criticæ de Variis Bibliorum Editionibus* (1684); *De l'Inspiration des Livres Sacrés* (Rotterd. 1687); and *L'Histoire Critique des Principeaux Commentateurs du Nouveau Testament* (Rotterd. 1692), in which he assails the theology of the Fathers, particularly Augustine, as a departure from the simple and less rigid doctrines of the primitive church. Among the Fathers, his most esteemed authority was Chrysostom; though indeed he seems not to have accepted the opinions of any of the Fathers as authority, and to have had contempt for tradition. Bossuet replied to this last work by *Defense de la Tradition et des Saints Pères.* S. frequently published under assumed names—as his *Dissertation Critique* on Dupin's *Library of Ecclesiastical Writers*, under the name of Jean Reuchlin; and *Histoire de l'Origine et du Progrès des Revenus Ecclésiastiques* under the name Jerome Acosta. No collected ed. of his works has appeared: the most famous of them are displaced by recent, and often second-hand compilations.

SIMONIDES, *sī-mŏn'ĭ-dēz*, of Ceos: celebrated Greek lyric poet: B.C. 556—B.C. 467; b. Iulis, in the island of Ceos. He was educated probably with a view to music and poetry as his profession. Hipparchus, by means of great rewards, induced him to reside at Athens, where also lived at that time Anacreon, and Lasus, the teacher of Pindar, though no intimacy seems to have sprung up between S. and his two rivals. It was probably after the expulsion of Hippias B.C. 510, that he took up his residence in Thessaly, under the patronage of the Aleuads and Scopads, who appear to have treated him in a niggardly fashion. Shortly before the invasion of Greece by the Persians, he returned to Athens, and employed his poetic powers in elegies, epigrams, dirges, etc., in connection with that momentous struggle—taking the prize, in regard to the battle of Marathon, out of the hands of his rival Æschylus. In B.C. 477, when S. was 80 years of age, he came off victor for the 56th time in a poetical contest at Athens. Shortly after this, he went to reside at the court of Hiero of Syracuse, where he died at the age of 90. S. appears to have scandalized his contemporaries by writing for hire; and Pindar, his great rival, accuses him of avarice. His poetry is imbued with a morality high for his times. He brought to perfection the elegy and epigram, and excelled in the dithyramb and triumphal ode; he seems also to have completed the Greek alphabet by the addition of the double letters and long vowels, and to have invented the art of artificial memory. The characteristics of his poetry are sweetness, polish combined with simplicity, genuine pathos, and great power of expression, though in originality he is much inferior to his contemporary Pindar. The best ed. of his fragments is that of Schneidewin, entitled *Simonidis Cei Carminum Reliquiæ* (Brunswick 1835).

This S. must be distinguished from the iambic poet SIMONIDES of Amorgos, who lived about 100 years previous.

SIMONOSEKI, *sĭm-ō-nō-sā'kē:* town of Japan, 33° 56′ n. lat., 131° e. long.; at the s.w. extremity of the island of Nipon, at the entrance of the inland sea Suonada. It is surrounded by hills, and consists largely of one main street. The warehouses—principal buildings—are of mud and wood, coated with cement, and are said to be fireproof. S. is a depot for receiving European imports from Nagasaki, to be sent into the interior; also for the produce from Osaca, which is re-shipped to Nagasaki and other places. —Pop. 30,825.

SIMONTON, *sī'mon-ton*, JAMES WILLIAM: journalist: 1823, Jan. 30—1882, Nov. 2; b. Columbia co., N. Y. He obtained his education in the public schools of New York, became local reporter for the *Courier and Enquirer* 1843, and soon afterward went to Washington to report congressional affairs. In this position he remained till 1850, and gained the friendship of Webster, Clay, Benton, and other eminent men of that day. He was associated with George Jones and Henry J. Raymond in founding the *New York Times*, 1851, served as its Washington correspondent several years, also furnished news-letters for some of the leading papers of the south and west. Removing to San Francisco 1859, he bought an interest in the *Evening Bulletin*, and afterward became one of the proprietors of the *Morning Call*. He served as war-correspondent 1861–65, was agent of the Associated Press in New York 1867–81, and resigned in the latter year on account of ill health. He died at Napa, California.

SIMONY, *sĭm'ŏ-nĭ* [from *Simon* Magus, who offered to purchase with money the power of bestowing the gift of the Holy Spirit from the apostles]: crime of illegally buying or selling ecclesiastical preferment; corrupt presentation to a benefice for 'money, gift, or reward'—but an offense punishable only by ecclesiastical law in England, not by criminal law. SIMONIAC, n. *sĭ-mō'nĭ-ăk*, one who illegally buys or sells preferment in the church. SIMONIACAL, a. *sĭm'ŏ-nī'ă-kăl*, guilty of simony, or tainted with it. SIM'ONI'ACALLY, ad. *-lĭ*. SIMONIAN, n. *sĭ-mō'nĭ-ăn*, follower of Simon Magus, whose creed was of the Gnostic kind (see GNOSTICS).—*Simony* is the sale, or attempted sale, of things spiritual, or of 'anything annexed to spirituals,' for money or for anything of a 'temporal' nature. In the canon law S. has always been regarded as a heinous offense, punishable with privation of benefice and deposition from orders if the offender was a cleric; nevertheless S. was one of the crying evils of the mediæval church.

Under the Eng. law, it is not S. for a layman or spiritual person, not purchasing for himself, to purchase while the church is full, either an advowson or next presentation, however immediate may be the prospect of a vacancy, unless that vacancy is to be occasioned by some agreement or arrangement between the parties. Nor is it S. for a spiritual person to purchase for himself an advowson, though under similar circumstances. It is, however, S. for any person to purchase the next presentation while the church is vacant; and it is S. for a spiritual person to purchase

for himself the next presentation, though the church be full.—In the United States, law takes no cognizance of simony.

SIMOOM, n. *sĭ-môm'* [Ar. *samûm*, what is hot or poisonous or dangerous—from *samm*, poisoning]: the hot suffocating winds peculiar to the hot sandy deserts of Africa and w. Asia, and to regions contiguous to them. In Egypt, it is called *khamsin* [Ar., fifty] because it generally continues to blow for 50 days, from the end of April to the time of the inundation of the Nile, in June.

Owing to the great power of the sun's rays, the extreme dryness of the air, and the small conducting power of sand causing the accumulation of heat on the surface, the superficial layers of sand in the deserts of Africa and Arabia often become heated to 200° F. to a depth of several inches. The air, also, resting on this hot sand becomes highly heated, thus giving rise to ascending currents; air consequently flows toward these heated places from all sides and these different currents meeting, cyclones or whirling masses of air are formed, which are swept onward by the wind prevailing at the time. Since the temperature, originally high, is still further raised by the heated grains of sand with which the air is loaded, it rapidly increases to a degree almost intolerable. In the shade, it was observed by Burkhardt 1813 to have risen to 122°; and by the British embassy to Abyssinia, 1841, to 126°. It is to the parching dryness of this wind, its glowing heat (about 200° in the sunshine), and its choking dust, and not to any poisonous qualities it possesses, that its destructive effects on animal life are to be ascribed.

The approach of the simoom is indicated first by a thin, often reddish dun haze along the horizon, which rapidly becomes denser, and quickly overspreads the whole sky. Fierce gusts of wind follow, with clouds of red and burning sand, which often present the appearance of huge columns of dust whirling forward; and vast mounds of sand are transported from place to place by the terrible energy of the tempest. By these mounds of sand large caravans are frequently destroyed; and even great armies have been overwhelmed by them, as in the case of Cambyses, who was overtaken by the simoom on his march through the desert to pillage the temple of Jupiter Ammon, and perished with 50,000 of his troops. The destruction of Sennacherib's army is supposed to have been caused by the simoom. The simoom generally lasts 6 to 12 hours, but sometimes longer.

The effects of this wind are felt in neighboring regions, where it is known under different names, and it is subject to important modifications by the nature of the earth's surface over which it passes. In Italy, it is called the *Sirocco* (q.v.), which blows occasionally over Sicily, s. Italy, and adjoining districts; this is a hot moist wind, receiving its heat from the Sahara and ac-

quiring its moisture in its passage n. over the Mediterranean. It is the plague of Sicily and Naples, and while it lasts a haze obscures the atmosphere, and such is the fatigue which it occasions that the streets of Palermo become deserted. The sirocco sometimes extends to the shores of the Black and Caspian Seas, and under its blighting touch, sheep and cattle die in the steppes beyond the Volga, and vegetation is withered and dried up. It is called the *Samiel* in Turkey, from its reputed poisonous qualities.—The *Solano* of Spain is a s.e. wind, extremely hot, and loaded with fine dust, which prevails at certain seasons in the plains of Mancha and Andalusia, particularly at Seville and Cadiz. It produces giddiness, and heats the blood to an unusual degree, causing general uneasiness and irritation; hence, the Spanish proverb: 'Ask no favor during the Solano.'—The *Harmattan* (q.v.) of Guinea and Senegambia belongs to the same class of winds.

SIMOUS, a. *sī'mŭs* [L. *simus;* Gr. *simos,* flat-nosed]: having a flat or snub nose, with the end turned up; snub-nosed.

SIMPER, v. *sĭm'pėr* [prov. Dan. *semper* or *simper,* affected, prudish: prov. Ger. *zimpera,* to be affectedly coy: Sw. *sipp,* finical, prim: Dan. *sippe,* a woman affectedly coy: Low Ger. *sipp,* a word expressive of affected pronunciation]: to smile in a silly or affected manner; to put on an air of restraint and modesty in the manner of smiling: N. an affected smile; a smirk. SIM'PERING, imp.: ADJ. smiling in an affected manner: N. act of one who simpers. SIM'PERED, pp. *-pėrd.* SIM'PERER, n. *-ėr,* one who simpers. SIM'PERINGLY, ad. *-lĭ.*

SIMPLE, a. *sĭm'pl* [F. *simple,* simple—from L. *simplex* or *simplĭcem,* plain, unmixed—from a root *sim,* appearing in L. *semel,* once; *plico,* I fold: It. *simplice*]: consisting of one thing; not combined; not compounded; not complicated; elementary; artless; harmless; inartificial; true to nature; unadorned; silly; shallow; in *bot.,* not branching; not divided into separate parts, as *simple fruits,* those formed by one flower: N. something not mixed or compounded; in *med.,* a single herb or plant, possessing a particular virtue. SIM'PLY, ad. *-plĭ,* in a simple manner; without art; plainly; of itself; merely. SIM'PLENESS, n. *-pl-nĕs,* the state or quality of being simple. SIM'PLETON, n. *-tŏn,* a person of weak intellect; a silly person. SIMPLICITY, n. *sĭm-plĭs'ĭ-tĭ,* state of being unmixed or uncompounded; reliance on natural grace; artlessness of mind; freedom from duplicity; plainness; silliness. SIMPLE-HEARTED, a. single-hearted; guileless. SIMPLE-MINDED, a. artless; undesigning. SIMPLEMINDEDNESS, n. artlessness. SIMPLE EQUATION, in *alg.,* an equation which contains the unknown quantity in the first degree.—SYN. of 'simple, a.': single; uncompounded; unmingled; unmixed; plain; artless; sincere; elementary; mere; uncombined; undesigning; harmless; open; unaf-

fected; frank; unadorned; credulous; foolish; silly; shallow; unwise; inartificial.

SIMPLE CONTRACT: any contract constituted by word of mouth or by a writing not under seal, nor of record. See CONTRACT.

SIMPLIFY, v. *sĭm'plĭ-fī* [F. *simplifier*, to simplify—from L. *simplex* or *simplĭcem*, plain, unmixed; *facĭō*, I make]: to make plain or easy; to render less complex or difficult. SIM'PLIFYING, imp. SIM'PLIFIED, pp. *-fīd*. SIM'PLIFICA'TION, n. *-fĭ-kā'shun* [F.—L.]: the act of simplifying or making simple.

SIMPLON, *sĭm'plŏn* (It. *Sempione*): famous mountain in Switzerland, one of the Lepontine Alps, in the e. of the canton of Valais, near the Piedmontese frontier; height 11,124 ft. The *Simplon Road*, one of the greatest engineering achievements of modern times, leads over a shoulder of this mountain (the *Pass of the Simplon*, height 6,592 ft.) from Brieg in Valais to Domo d'Ossola in n. Piedmont. The road was commenced 1800 under the direction of Napoleon, and was completed 1806. It is 25 to 30 ft. broad, and has nowhere a slope greater than 1 in 13. It is carried across 611 bridges, over numerous galleries cut out of the natural rock, or built of solid masonry, and through great tunnels. Close to the highest point is the *New Hospice*, one of the 20 edifices on this route for shelter of travellers. The *Simplon railway tunnel* through the mountain from Brieg in the valley of the Rhone, Switzerland, to Iselle in Italy, was commenced in 1898, Nov. 13, the boring completed 1905, Feb. 24, and the road opened to railway traffic, Apr. 2. The work involved numerous serious and unexpected engineering difficulties, such as floods of hot and cold springs, and quicksands, which at times almost led to the abandonment of the work. The tunnel, 12¼ m. long, is the lengthiest in the world, excepting the St. Gothard by over 3 m., and the Mt. Cenis by 5 m., these three tunnels now connecting in Italy and outlying countries by direct rail. The Swiss and Italian governments jointly financed the undertaking at the cost of $15,000,000.

SIMPSON, *sĭmp'son*, Sir JAMES YOUNG, M.D.: 1811-1870, May 6; b. Bathgate, Linlithgowshire, Scotland. In his studies at the Univ. of Edinburgh he inspired his teachers with an interest in his future. He graduated in medicine 1832; and Prof. Thomson chose him as assistant, and employed him in preparation of his course of lectures on general pathology. He began professional practice on his own account; and 1840 succeeded Hamilton as prof. of midwifery in the University of Edinburgh, in which position, by the rigidly scientific, while popularly attractive, character of his prelections, he contributed greatly to the renown of the Edinburgh school. His two vols. of Obstetric Memoirs contain the fruits of patient and ingenious research. He is remembered particularly for his discovery of the anæsthetic virtues of

chloroform. The so-called sulphuric ether had been employed in America by Morton to produce anæsthesia during parturition; but Simpson introduced 1847 the far safer and more certain agency of chloroform. Surgical practice owes to him the stoppage of hemorrhage by Acupressure. He made valuable contributions to antiquarian research. He read many papers and notices before the Royal and Antiquarian Societies of Edinburgh. His scientific services were recognized by innumerable medical associations; and his professional distinction secured for him a baronetcy 1866. A statue was erected in Edinburgh 1877.

SIMP'SON, MATTHEW, D.D., LL.D.: pulpit orator and Methodist Episcopal bishop: 1811, June 20—1884, June 18; b. Cadiz, O. He was educated at Madison College, since united with Allegheny College, at Meadville, Pa. Entering on the profession of medicine at 22 years of age, he soon abandoned it for the Christian ministry, 1834, becoming a circuit preacher in Ohio; the next year residing at Pittsburgh, and 1837 at Williamsport, when he was chosen professor of nat. science in Allegheny College. Two years later he was elected to the presidency of De Pauw (then Asbury) University, at Greencastle, Ind., where he served nine years. His success in government, and in advancing the financial interests of the university, was notable. In 1852 he was elected bishop, and 1857 he went abroad as delegate to the Wesleyan conference, and to the Evangelical Alliance at Berlin. His addresses and sermons before these bodies added to his wide fame as a speaker. Before returning, he travelled through the countries bordering on the e. Mediterranean. In 1859 he acted as president of the Garrett Biblical Institute at Evanston, Ill., and later removed to Philadelphia. His work and appointments required him to visit Europe 1870, 75, and 81, the last voyage to attend the Methodist Ecumenical Council in London, on which occasion he gave the opening discourse, also an address in Exeter Hall on the death of President Garfield, immediately on receiving the news of the assassination. In 1874 he visited Mexico, where Methodist missions had been established. His reputation was high as an accomplished presiding officer, but chiefly as an unaffected, chaste, earnest, and eloquent speaker, preferred above all others by President Lincoln, at whose funeral he officiated. He died at Philadelphia.—Among his works are: *A Hundred Years of Methodism* (1876); *Cyclopedia of Methodism* (1878); Yale *Lectures on Preaching* (1879). A posthumous volume of his *Sermons* was published by George R. Crooks, D.D. (1885).

SIMPSON COLLEGE: located at Indianola, Iowa. It was founded in 1867 by the Des Moines Conference of the Methodist Episcopal Church, from which it derives most of its support and patronage. Its organization includes seven departments: (1) college of liberal arts;

(2) academy and normal courses; (3) the school of business; (4) the school of shorthand and typewriting; (5) the conservatory of music; (6) the school of oratory; (7) the school of art. A summer school is also maintained. The college department offers three courses, classical, philosophical and scientific, leading to the degrees of bachelor of arts, bachelor of philosophy, and bachelor of science; these courses are all largely elective, the choice of the student being limited to a certain extent by the degree he wishes to obtain. Graduate work is provided for, leading to the degrees of master of arts, master of philosophy, and master of science. Military drill and military science are a part of the curriculum, but are elective, except that drill is required for the men in the first two terms of the freshman year. The academic department offers three courses in preparation for the three college courses; there are two normal courses offered, one of three years, and one of five years, the work of the last two years of the latter course being almost entirely elective. The college is co-educational and there is a dormitory for women on the campus. The students of the different departments maintain a number of literary societies, all of which have their furnished halls. The college athletics are under the control of a joint committee, two members of which are appointed by the faculty, and three by the athletic association. The buildings are College Hall, Science Hall, Ladies' Hall, the administration building, the gymnasia, and the Conservatory of Music (erected 1902); the library contains 5,000 volumes. The students number over 900 and the faculty 22.

SIMROCK, *sĭm'rok,* KARL: German poet and scholar, who has done more perhaps than any other man to make his countrymen familiar with their early literature: 1802, Aug. 28—1876, July 18; b. Bonn. He studied at the Univ. of Bonn, and afterward at Berlin; and 1823 entered the Prussian state service. His first work was a translation into modern German of the *Nibelungenlied* (Berl. 1827; 9th ed. Stuttg. and Tüb. 1854), followed by a translation of the songs admitted by Lachmann to be genuine, under the title *Zwanzig Lieder von den Nibelungen* (Bonn 1840). Soon after the publication of his translation of Hartmann von der Aue's *Armer Heinrich* (Berl. 1830), he was compelled to leave the Prussian service on account of a revolutionary poem which he wrote. Afterward he applied himself exclusively to literature, particularly to the early literature of his own country, which he modernized in splendid style. In 1850 he was appointed prof. of German language and literature at Bonn, a situation which he held till his death. His principal work besides those above mentioned are: *Quellen des Shakespeare in Novellen, Märchen, und Sagen* ('Sources of Shakespeare in Novels, Tales, and Legends,' 3 vols. Berl. 1831), executed in conjunction with Echter-

meyer and Henschel, but of which the most important part was Simrock's; *Novellenschatz der Italiener* (Berl. 1832); translation, with commentary, of the poems of Walther von der Vogelweide (2 vols. Berl. 1833), in conjunction with Wackernagel, and of *Wieland der Schmied. Deutsch Heldensage* (Bonn 1835), one of the freshest of the German mediæval epics; *Rheinsagen aus dem Munde des Volkes und Deutscher Dichter, für Schule, Haus, und Wanderschaft* ('Legends of the Rhine from the Mouth of the People and German Poets, for School, Home, and Travelling,' 4th ed. Bonn 1850, latest ed. 1857; collection of German *Volksbücher* ('People's Books'), comprising national proverbs, songs, and riddles, besides a vast quantity of stories (these carried on for several years, include many vols.); translation of Wolfram von Eschenbach's *Parzival und Titurel* (Stuttg. and Tüb. 1842); *Das Heldenbuch,* partly translations and partly original poems (1843-49). A separate collection of his own poems (*Gedichte*) was published at Leipzig (1844; new ed. 1863). Later publications are a translation of the Songs of the Edda (Stuttg. and Tüb. 1851, third ed. 1863); *Handbuch der Deutschen Mythologie* (2 vols. Bonn 1853-55; 2d ed. 1864); *Gedichte Shakespeares* (1867).

SIMS, George Robert: English poet and dramatist; b. London 1847, Sep. 2. He was educated at Hanwell College and at Bonn, and since 1874 has been engaged as a journalist and playwright. His publications include: *Dragonet Ballads* (1879); *How the Poor Live* (1883); *Once Upon a Christmas Time* (1898); *Living London* (1902); etc. His plays include: *The Lights of London* (1882); *Two Little Vagabonds; In London Town; Scarlet Sin;* and more than 20 others, of which he wrote all or part.

SIMS, James Marion, M.D.: surgeon: 1813, Jan. 25—1883, Nov. 13; b. Lancaster co., S. C. Having graduated at the S. C. College, he began the study of medicine 1832, and received the degree of M.D. from the Jefferson Medical College, of Philadelphia 1835. He practiced his profession first in his native county, then in Alabama; he was settled in Montgomery 1840-53, during which time he achieved great distinction as a surgeon by his successful operations for strabismus and for club-foot, but particularly by his discovery of the cause and proper treatment of the lock-jaw of infants, and his invention of the silver suture for use in treating vesico-vaginal fistula, and of the 'Sims speculum.' With health dangerously impaired by chronic diarrhea of three years' standing, Sims removed to New York 1853. In the face of determined opposition from the medical profession, he opened a hospital for treatment of women's diseases in New York 1855: an appropriation of $50,000 was made by the legislature 1857. Sims visited Europe 1861, and again

1862, when he decided to commence practice in Paris. He was settled in London 1864–68, and then returned to New York. In the Franco-German war S. was surgeon-in-chief of the Anglo-American ambulance corps, organized by him at Paris. Returning to New York, he was appointed a member of the board of surgeons of the Woman's Hospital. He was author of many contributions to medical journals, and pub. *The Story of My Life* 1884.

SIMSON, *sĭm'son*, ROBERT, M.D.: Scotch mathematician: 1687, Oct.—1768, Oct. 1; b. Kirktonhill, in Ayrshire. He was educated at the Univ. of Glasgow with a view to the clerical profession, and attained great eminence in classical and mathematical knowledge. His taste for mathematics gradually gained ascendency, and all other pursuits were abandoned. He was appointed prof. of mathematics in Glasgow 1711; and served for 50 years. S.'s reputation rests chiefly on his 'restorations,' more properly 'reconstructions,' of the Greek geometers. Some good judges are of opinion that he has corrected many errors in the original text, though his respect for the Greek mathematicians always led him to refer these to the ignorance of editors and the negligence of copyists. His first success in this direction was to discover the signification of Euclid's porisms, the only datum being a most obscure and tantalizing description of them by Pappus, whose indefiniteness had foiled Fermat and Halley. A similar success, on the 'loci plani' and the 'sectio determinata' of Apollonius, stamped him as one of the most elegant geometers of modern times. His correction of Euclid's *Elements*, pub. 1758, has been frequently re-edited and republished as a school-book, especially the ed. by Playfair. An edition of Pappus, discovered after S.'s death, was presented to the Univ. of Oxford.

SIMULACRUM, n. *sĭm'ū-lā'krŭm*, SIM'ULA'CRA, n. plu. *-krā* [L. *simŭlācrum*, an image—from *simŭlo*, I represent—from *simĭlĭs*, like]: a form or image of an object of sense or thought presented to the mind; a shade or phantom as seen in a mirror or a dream.

SIMULAR, a. *sĭm'ū-lĕr* [F. *simuler*, to feign—from L. *simulārĕ*, to represent—from *simĭlĭs*, like]: in *OE.*, counterfeit; plausible: N. one who counterfeits.

SIMULATE, v. *sĭm'ū-lāt* [L. *simulātus*, imitated, pretended; *simulārĕ*, to imitate—from *simĭlĭs*, like: It. *simulare:* F. *simuler*]: to assume the appearance of without the reality; to feign; to pretend: ADJ. feigned; pretended. SIM'ULATING, imp. SIM'ULATED, pp.: ADJ. pretended; feigned. SIM'ULATOR, n. *-tĕr*, one who feigns. SIM'ULA'TION, n. *-lā'shŭn* [F.—L.]: the act of assuming to be that which one is not.—SYN. of 'simulate, v.': to feign; pretend; assume; counterfeit.

SIMULTANEOUS, a. *sī'mŭl-tā'nĕ-ŭs* or *sĭm'ŭl-* [L. *simul*, together, at once: It. *simultaneo;* F. *simultané*, simultaneous]: existing or happening at the same time. SIMULTA'NEOUSLY, ad. *-lĭ*. SIMULTA'NEOUSNESS, n. *nĕs*, the state or quality of being simultaneous.

SIN, ad. *sin:* OE. for SINCE.

SIN, n. *sin* [Ger. *sünde;* Dan. and Sw. *synd;* AS. *syn;* Icel. *synd*, sin—the radical meaning being probably 'breach': Norw. *synd*, sin, breach of right: L. *sons*, hurtful, guilty]: any action, word, or thought contrary to the law of God; the habitual neglect of religion; transgression; the omission of duty; a wicked act; in *Shak.*, a man enormously wicked: v. to violate any law of God; to do wrong. SIN'NING, imp. SINNED, pp. *sind.* SINNER, n. *sin'nĕr*, one who disobeys any divine law or precept; an unregenerate person; an offender. SIN'FUL, a. *-fŭl*, wicked; unholy; contrary to the laws of God. SIN'FULLY, ad. *-lĭ.* SIN'FULNESS, n. *-nĕs*, wickedness; depravity. SIN'LESS, a. *-lĕs*, free from sin; innocent. SIN'LESSLY, ad. *-lĭ.* SIN'LESSNESS, n. *-nĕs*, freedom from sin or guilt. SIN-BORN, a. derived from sin. SIN-OFFERING, the sacrifice offered under the Mosaic law, as an expiation for the sin of the people, considered different from the *trespass-offering*, which is thought to have been appointed for special cases of sin. ACTUAL SIN, in *theol.*, the violation of a known rule of duty. DEADLY or MORTAL SINS, in the *Rom. Cath. Chh.*, the seven sins of murder, lust, covetousness, gluttony, pride, envy, and idleness, which take away sanctifying grace. VENIAL SINS (q.v.), in *Rom. Cath. Chh.*, those sins which weaken sanctifying grace, but do not take it away, and which it is not necessary though commendable to mention in confession. ORIGINAL SIN, in *theol.*, the native depravity of the heart; the corruption of man's whole nature, resulting from Adam's transgression.—SYN. of 'sin, n.': crime; offense; transgression; trespass; iniquity; wrong; vice; guilt; misdemeanor; misdeed; injury; wickedness; injustice.—*Sin* is a term applied by theologians to the moral defect or perversion of human nature, which appears an inherent quality of the human will, and, in a greater or less degree certainly, characterizes it in this life. It is something more than natural evil, i.e., the evil which is affirmed of the external world or of the lower creation. *Evil*, as denoting decay or corruption in nature is admittedly a mere relative term; for in truth decay is as normal a process in creation as renovation, and corruption is the condition of restored health and beauty. In a similar manner, evil such as it exists in the lower animal creation, in the form of *prey* and in the forms of pain, of sickness, and of death—whatever be the special view taken of such phenomena—is never reckoned evil in the sense of *Sin*, i.e., *moral* evil. In order to constitute the special idea of sin, it is always necessary to suppose a moral element in the evil to which it is applied. Whatever form of evil is independent of the human will as its source, origin, or agent, is not sin. Theologians, indeed, speak of *original sin*, or the sin of human nature, as distinguished from *actual sin*, or the particular transgression of the individuals composing mankind. According to a common theological theory, men are not only sinners individually, but they are partakers of a sinful nature, with which their will has had nothing to do—with reference to which they have had no choice of good or evil: the evil has come to

them by natural descent from the original parents of the race. But even the most extreme view of original sin preserves a hypothetical relation between every individual will and the primal transgression which it considers to be sin, not merely in those who committed it, but in those who have descended from them. All mankind are supposed to have really existed in Adam, the first sinner, who thus was literally their representative, so that 'they sinned in him and fell with him in his first transgression.' Without such a hypothesis of unity between Adam and his race, so that his will was in some measure the typical or representative will of the race, the notion of original sin could not be maintained. For the relation between sin and will as a moral power, having the choice of good and evil, is a cardinal relation without which it would seem impossible to distinguish sin as a quality from other forms of evil in the world.

SINAI, *sī'nā* or *sī'nā-ī:* mount on which, according to the Pentateuch, God announced to Moses the ten commandments and the other laws by which the Israelites were to be bound. Its exact position is matter of dispute, but it is to be sought for in the mass of granite and porphyry mountains occupying the greater part of the Arabian peninsula, between the Gulf of Suez and Akabah, and rising 8,000 or 9,000 ft. above sea-level. This mountain-mass is divisible into three groups: a n.w., reaching in Mount Serbal an elevation of 6,340 ft.; an e. and central, attaining in Jebel Katherin 8,160 ft., and a s.e., whose highest peak, Um Shaumer, is the culminating point of the whole Sinaitic range. Serbal, with its five peaks, appears the most magnificent mountain in the peninsula, and is identified with S. by the earlier church Fathers, Eusebius, Jerome, Cosmas, etc.; but it does not meet the requirements of the Hebrew narrative, and even as early as the time of Justinian, the opinion that Serbal was the S. of Moses had been abandoned, and to a ridge of the second or e. range that honor had been transferred, the n. summit of which is termed Horeb: its s. summit, Jebel-Mûsa or Mount of Moses, continues to be regarded as the true S. by the great majority of those scholars who look for any precise identification of some individual summit as the Mountain of the Law. Its height is variously estimated 6,800 to 7,100 ft. above sea-level.

At the e. base of Jebel-Mûsa, in the ravine of Shouaib, stands in solitary peace the famous monastery of Mt. S.; but in earlier times the mountain had numerous other convents, chapels, and hermitages.

SINAITIC, a. *sī'nā-ĭt'ĭk* or *si-nĭt'ĭk:* pertaining to Mount Sinai: made or given there, as the Mosaic law.

SINAITIC CODEX, *sī-nā-ĭt'ĭk kō'dĕks:* one of the two most ancient Greek manuscripts of the N. Test. and part of the Old, and the Apocrypha. It is numbered by the Hebrew letter ℵ (as the reputedly older MS., the *Vatican*, is by the letter B); and is named from Mount Sinai, where it was discovered by Tischendorf in the convent of St. Catherine 1844, when he brought away 43 of the 345½ leaves. On another journey thither 1859, he persuaded the monks to make a gift of the remainder to the czar. It is the great treasure of the imperial library at St. Petersburg, which contains no less than 26,000 codices. Of the leaves, nearly 200 are of the Old Test., Septuagint version, and contain I Chron. ix. 27—xi. 22; Tobet ii. 2 to the end; Judith i. 1—xi. 13; xiii. 9—xvi; I Macc.; IV Macc.; Isaiah; Jer. i. 1—x. 25; Joel; Obadiah; Jonah; Nahum; Habakkuk; Zephaniah; Haggai; Zechariah; Malachi; Psalms; Proverbs; Canticles; Wisdom of Solomon; Ecclesiastes; and Job. The N. Test. is entire, and appended to it are the Epistle of Barnabas and parts of the Shepherd of Hermas, now included in the apochryphal N. Test. writings. The style of uncial letters and other characteristics of the MS. indicate that it is even older than the Vatican codex, and the question was whether it is a somewhat later copy of an older text. In many respects it singularly corresponds with the Vatican codex, such as the style of inscription and subscription letters of each book, 'the absence of the Ammonian sections and the Eusebian canons, the nature of the readings,' etc. Tischendorf referred it to the middle of the 4th c., to which also the Vatican MS. belongs. It exhibits the usual slight errors manifestly due to copying from dictation. Tischendorf published full notes on it 1860, and more briefly as an accompaniment of the 7th ed. of his N. Test. In all he furnished 600 Sinaitic readings for the whole N. Test. But, as usual with the most ancient codices, the variations have few important bearings on the sense, much less affect seriously any doctrine or statement of fact. Take any chapter at random, e.g. Matt. vi.: verse 1 in the Sinaitic prefixes 'but,' and has 'righteousness' instead of 'alms;' verse 2 repeats 'verily;' verse 4 omits 'openly;' verse 5 has 'ye' for 'they;' verse 8 has 'God' for 'Father;' verse 12 has 'as we have forgiven' instead of 'as we forgive:' verse 13, as in the Vatican MS., omits 'for thine is the kingdom,' etc.; verse 15 omits 'their trespasses,' and has 'the' instead of 'your' before 'Father;' verse 16 omits 'the' before 'hypocrites,' and has 'face' instead of 'faces,' etc.—The Sinaitic agrees with the Vatican text in omitting the account of the woman taken in adultery, also in not having the last 12 verses of the received text of St. Mark's Gospel. This last bears on the date of the MS., since Eusebius (d. 340) and Jerome said that in nearly all trustworthy copies that Gospel ends with chap. xvi. 8; and it so ends only in these two existing codices. So also Basil the Great (d. 379) states that 'Ephesus' is wanting in Eph. i. 1, in the old MSS. of his day; and such is the fact in these two. There are other data of the same kind; and the two alone have

initial letters of the same size and sort as other letters, and in this agree with the Herculanean MSS. and disagree with the Alexandrine codex of the 6th c. Tischendorf thinks it probable that the Sinaitic codex is one of the 50 copies which Constantine in 331 directed to be made at Byzantium, under the care of Eusebius of Cæsarea, and that it was sent to Sinai by Emperor Justinian, founder of the convent. Three hundred copies of the entire codex were published by the czar Alexander II., with exactness and magnificence, 1862, the year following his emancipation of the serfs. The New Testament portion was issued in a portable form 1863 and 65. Tischendorf's English New Testament, with a page of fac-similes and foot-notes from the three oldest codices, was made the thousandth volume of the Tauchnitz series, 1869. In the preface he says, 'Providence has ordained for the New Testament more sources of the greatest antiquity than are possessed by all the old Greek literature put together.'

SINAITIC INSCRIPTIONS: name given to peculiar marks scratched on the rocks of the Sinaitic peninsula, which have aroused much comment in all ages. The first mention is traced to Diodorus Siculus, who states that in his time there was a stone altar, with inscriptions in all unknown characters, in an oasis in the wilderness of Sinai, to which people in the surrounding country would make pilgrimages every five years. These marks, apparently Greek, Latin, and Nabataean, are accompanied by rude figures of men with shields, or other weapons, antelopes, lizards, and many nondescript animals. They are encountered in all parts of the mountainous region, in groups or singly, and occur in greatest number in Wady Mokatteb. The inscriptions are short, their position on the face of the cliff being so low that a man could reach them. As to the theories of their origin, Prof. Baer of Leipsic finds the alphabet independent. The contents appear, so far as examined, only of proper names common in Arabic; the language is supposed to be Nabataean, the writers were pilgrims, not earlier than the fourth century. Prof. Tuch of Leipsic fixes the date as not later than the second century, the language being Arabic, the writers being ancient heathen inhabitants. Dean Stanley attributes the marks to Christian pilgrims. Some maintain they are of Israelitish origin. Palmer, in his *Ordinance Survey of Sinai,* investigated these remains and concludes that they are 'mere scratches in the rock, the work of idle loungers, consisting in the most part of names interspersed with rude figures of men and animals.'

While of some interest philologically, they are as worthless and unimportant as the Arab, Greek and European figures with which they are interspersed. The language is Aramaean, the popular tongue of the early Christian centuries, differing little in character from the

Nabataean alphabet in the Idumaean and Central Asian inscriptions. See Palmer's *Desert of the Exodus;* Ebers, *Durch Gosen und Sinai* (1872).

SINALOA, *sē-nâ-lō'â:* Mexico, a state bounded on the north by Sonora and Chihuahua, on the east by Chihuahua and Durango, on the south by the territory of Tepic and the Pacific Ocean, and on the west by the Gulf of California. Area 33,671 square miles. From the Gulf, the land rises gradually to the Sierra Madre Mountains, the principal range in the state. There are numerous rivers, some of which are navigable. The district of mines (gold, silver, copper, iron, and lead) is in the east. The low and hot western belt is devoted to agriculture, the chief products being cereals, cotton, tobacco, sugarcane, coffee, and fruits. The two customs ports are Altata and Mazatlán. The capital of the state is Culiacán Rosales. The largest city is Mazatlán. Total population 296,109.

SINAPISINE, n. *sĭn'ă-pī'sĭn* [L. and Gr. *sināpī,* mustard]: peculiar principle found in the seed of white mustard. SIN'APISM, n. *-pĭzm,* a mustard-poultice. SINAPOLINE, n. *sĭn-ăp'ō-lĭn,* substance ground from oil of mustard. SINAPIS. See MUSTARD.

SINCE, conj. *sĭns* [AS. *sith,* after, later: Scot. *syne,* since: Icel. *síd, sídar,* late, later; *senin,* slow, late: Ger. *seit,* since]: because that; from the time when: AD. ago; past; before this: PREP. after; reckoning from; from the time of.—SYN. of 'since, conj.': because; for; as; inasmuch as; considering.

SINCERE, a. *sĭn-sēr'* [F. *sincère*—from L. *sincērus,* pure, entire: It. *sincero*]: unfeigned; being in reality what it appears to be; true; genuine; real; in *OE.,* unhurt; uninjured. SINCERE'LY, ad. *-lĭ.* SINCERE'NESS, n. *-nĕs,* or SINCER'ITY, n. *-sĕr'ĭ-tĭ,* honesty of mind or intention; freedom from hypocrisy or false pretense; genuineness; truthfulness.—SYN. of 'sincere': honest; undissembling; uncorrupt; hearty; unfeigned; real; true; unvarnished; unaffected; inartificial; upright; frank.

SINCERE BRETHREN, or TRUE FRIENDS: semi-religious, semi-scientific Mohammedan order, whose beginnings are obscure, but which, about A.D. 970, manifested its existence by one of the boldest and most comprehensive literary undertakings—an encyclopedic treatment of philosophy, theology, science, ethics, and metaphysics, in a series of 51 treatises. See MOHAMMEDAN SECTS, especially MOTAZILITES, for notice of that immense religious struggle that arose but a few generations after Mohammed, in the bosom of Islam, bringing forth sect after sect; and which, under whatever name, simply denoted the reaction of the thinking minds against the dead weight of dogma and formula which the successors of the Prophet tried in his name to impose on the Faithful. What the Motazilites had attempted was the reconciliation of scientific speculation, as it had grown up at

the first contact of the Arabs with Greek literature, with the religious dogma of Islam. This new development of Arabic culture, which chiefly characterizes the epoch of the first Abbaside rulers, was of brief duration. The representatives of the 'orthodox' schools, insisting on the most literal interpretation, used the same weapons of dialectics which their adversaries had taught them to wield. They soon built up a scholastic edifice of theology, not easy to be attacked without direct outspokenness; and from this the new schools, with the terror of the caliphate strong upon them, shrank. Thus the Motazilites soon disappeared from the arena. But their labors had not been in vain. Silently and by degrees this mysterious union of the S. B. arose. Though widely spread, their schools, their houses of assembly, their rules, their doctrines, everything, remained, we know not how long, a profound mystery; and apart from that which they themselves have revealed, neither ancient nor modern investigation has discovered many traces of their inner organization and activity. Not even many of their names have come down to us, though the 'treatises' that they have left point to a multitude of authors and to many stages of development. The tone of these treatises is much more free, and their entire tendency more radical than that of any of the books of their predecessors. Yet, the desire not to offend the less advanced in religious matters, and above all, to reunite rather than to make the breach wider, is perceptible in their endeavor to use, or rather abuse, what Koranic quotations and traditions could be pressed into the service of free thought by often unnatural processes of allegory and mysticism.

It is known that in their houses of assembly at those 'stated periods,' at which no stranger was to be admitted, the principal conversation was on the knowledge of the soul or psychology, the knowledge of the action of the senses and the things perceptible through them, the contemplation and investigation of the mysteries of the sacred books, and the prophetical revelations, and the ideas contained in the divine laws. The attention of the S. B. was further to be directed to the four 'mathematical' sciences —arithmetic, geometry, astronomy, and (musical) composition. But their chief subject was to be the knowledge of divine things. The most catholic spirit was to prevail regarding the various sciences, systems, or books; since 'our own system comprises all, without exception, and includes all science.' 'The speculations of our school extend simply to all things—the sensual and the intellectual —from the moment of their beginning to their end, according to their outer and inner life—that which is palpable and clear about them, and that which is hidden and secret—the Truth, in fact. For the true essence in everything is derived from one primeval origin and general cause, since there is but one world and one supreme mind, to which all the most manifold phenomena, species and kinds, and divisions, are to be traced back.'

All their knowledge they traced back to four sources—

a number which played a considerable part in all their divisions: 1. 'The books that are known by the names of the sages and philosophers,' i.e., the translations of Greek works of Pythagoras, Aristotle, Euclid, Ptolemy, Porphyry, etc. 2. 'The revealed writings derived from the prophets,' e g. the five Books of Moses, the Gospel, the Psalms, the Koran, and other writings of prophets who had received their contents through inspiration by the angels. 3. 'Books treating of nature'—i.e., of the celestial circles, motions of the stars, transformation of matter, species and kinds of animals, plants, etc. 4. 'The divine books, written by the angels from the tablet of Fate, on which all the divine decrees regarding the world and man are inscribed. These contain all that refers to substances, species, kinds, and orders of the different souls; their actions, destinies, metamorphoses, phase after phase, the heavenly conjunctures and periods, etc.'

The encyclopedia of treatises, the monument of this secret association, was compiled first at Basrah about 1000; but has (except one often reproduced chapter, 'The Contest between Man and Animal') never been printed.

Great interest attaches to this production, as the earliest encyclopedia deserving the name, reflecting, as it does, the state of science both of the East and of the West at the end of the first thousand years after the introduction of Christianity. The 51 treatises are defective in system and often fail to be instructive in details; yet they belong to the most comprehensive efforts of the human mind. The chief cause of the discontent which these treatises excited among contemporaries lay in their conciliatory tendencies, for which Mohammedan theology had neither use nor place.

On this subject what fragmentary information we possess lies scattered in Oriental 'Transactions,' in notes and in prefaces.—See Sprenger, in *Asiatic Journal* of Bengal; Flügel, in *Deutsche Morgenl. Zeitschrift;* De Sacy, *Notices et Extraits;* Dieterici, *Mensch und Thier;* Nauwerck; etc.

SINCIPUT, n. *sĭn'sĭ-pŭt* [L. *sincĭput*, the forepart of the head—from L. *semi*, half; *caput*, the head]: the fore part of the head; opposite of *occiput*, back part of the head.

SINCLAIR, *sĭn'klär*, FAMILY OF. Scottish historical house of Norman descent, the surname Sinclair or St. Clair (Latinized *De Sancto Claro*) being doubtless derived from possessions in Normandy. Two families bearing this surname, whose connection cannot now be traced, the St. Clairs of Rosslyn and of Herdmanston, appear in Mid-Lothian and E. Lothian in the beginning of the 12th c. Henry St Clair, *Vicecomes* of Richard Morville, Chancellor of Scotland, obtained, in 1162, a charter of the lands of Herdmanston, which have continued in the family. The ancestor of the other line was William St. Clair, who had Rosslyn confirmed to him by charter from David I. His descendant was, like his contemporary of the Herdmanston line, a companion-in-arms of Robert I. With the Douglas, he fell in battle against the Moors 1330.

But the fortunes and importance of the family were due principally to the marriage of the son of this Sir William with the daughter of Malise, Earl of Strathearn, Caithness, and Orkney, and heiress of the Norwegian Jarls of the Orkneys. In this way the St. Clair family acquired the Earldom of Orkney, but under fealty to the king of Norway; the Orkney earldom was, however, confirmed to him by Robert II.; and for the next two generations the power of the family was little less than princely, the St. Clair influence being further increased by intermarriages with near relatives of the royal house of Scotland. William, the third earl, held the high offices of lord admiral, lord justice-general, lord chancellor, and lord warden of the three Marches. He was made Earl of Caithness 1450. At his castle of Rosslyn he kept almost regal state and pomp. His daughter was given in marriage to Alexander, Duke of Albany, son of James II. The earl, instead of keeping his great possessions united, partitioned them among his three sons in such a way as contributed to reduce the family influence. On William, his eldest son, he bestowed merely the lands of Newburgh, in Aberdeenshire; on his second, Sir Oliver, he settled all his estates south of the Tay; while, with consent of the crown, he conveyed the earldom of Caithness to his youngest son, also named William. The earldom of Orkney he had resigned into the hands of James III., receiving therefor lands in Fifeshire and elsewhere.

LORDS SINCLAIR.—The eldest son of this last Earl of Orkney was still Lord S.; and on his death, on the field of Flodden, he was succeeded by a line of Lords S., who ranked among the more considerable of the Scottish nobility. His grandson, by a daughter, was the notorious Earl of Bothwell, third husband of Queen Mary, and whom, in memory of his maternal descent, that unhappy queen created Duke of Orkney. The seventh Lord S. had no male issue, but a daughter, married to St. Clair of Herdmanston, representive of the other house of Sinclair above alluded to. The son of this marriage, in virtue of a new patent obtained from Charles II., became eighth Lord S. —this patent, singularly, bringing in, on failure of heirs male, his paternal relatives, the St. Clairs of Herdmanston, strangers in blood to the former Lords S.

EARLS OF ROSSLYN.—Rosslyn had been purchased from Sir Oliver S. by one of the sons of the eighth Lord S.; and the title with the estates both of Rosslyn and of Dysart, went to the issue of the eighth lord's second daughter, whose grandson, Sir James Erskine of Alva, succeeded to the earldom of Rosslyn.

SINCLAIRS OF ROSSLYN.—Sir Oliver S., the above-mentioned second son of the last Earl of Orkney, was progenitor of a line of barons who, for two centuries, owned the splendid domains of Rosslyn, and were buried in the vault of the chapel, in royal fashion, in their armor. Sir Oliver's second son was the noted Oliver S., favorite of James V., whom, to the general disgust, he placed in command of the army sent to encounter the English 1542. To the repugnance of the army to serve under him, is attributed the disgraceful rout of Solway Moss, where 10,000 Scottish troops fled at the sight of 300 English cavalry, to whom they can hardly be said to have made any resistance. The last of Sir Oliver's line, impoverished by the political troubles in which his support of the Stewarts had involved him, sold Rosslyn, which then became, as above noted, the property of the disinherited elder branch.

EARLS OF CAITHNESS.—This title was, as above noted, conferred on William S., youngest son of the last Earl of Orkney, and has been since held by his descendants in one branch or another. The third earl, ambitious enough to aspire to be an independent prince, endeavored, 1529, by force of arms, to recover the Orkneys from the crown; but lost his life in this conflict. The Sinclairs of Ulbster are sprung from a legitimated son of William S., second son to the fourth Earl of Caithness. See SINCLAIR, Sir JOHN.

SIN'CLAIR, Sir JOHN, Bart.: Scottish agricultural improver, patriot, and author: 1754, May 10—1835, Dec. 21; b. at Thurso Castle. He represented the Sinclairs of Ulbster, branch of the noble House of Caithness. After studying at Oxford Univ. he was admitted to the Scottish and English bars; but soon turned to the pursuits of public life. From 1780 he represented his native county in parliament for many years. He wrote pamphlets on public affairs—on the navy, the militia force, the national finances, etc. In 1784 he published a *History of the Revenue of the British Empire*, an elaborate work in two 4to vols.; 1786 he was created a baronet. He established agricultural societies which were of great benefit to the country. Sir John's most important undertaking was the *Statistical Account of Scotland*, completed after seven years' labor in 1798 (20 large vols.), and comprising a description of every parish in Scotland. Sir John wrote on all manner of topics; and his publications during 50 years are said to number 367. As financier and political economist he was consulted by Pitt. He raised for public defense 1794 a regt., and 1795 a battalion—each of a thousand men. He died at Edinburgh.—CATHERINE S. (1800-64), fourth daughter of the baronet, was author of tales and descriptive works—*Modern Accomplishments, Modern Society, Scotland and the Scotch, Shetland and the Shetlanders*, etc.

SIND, or SINDE, or SCINDE, *sĭnd*: extensive province in the extreme w of Brit. India; bounded n. by Beloochistan and the Punjab, e. by Rajputana, w by Beloochistan, s. by the Arabian Sea and the Great Western Runn, extensive lacustrine inlet which separates S. from Cutch; 380 m. in greatest length, 280 in greatest breadth, 47,066 Eng. sq. m. (besides a tributary area). The sea-coast, which extends n.w. 150 m., is very low and flat except the small portion beyond Karatchi (Kurrachi), and is studded here and there with low mud-banks formed by the Indus, or with sand-hills, the accumulated drift from the beach: it is overflowed at high tide to a considerable distance inland, and is hardly visible, according to Burnes, at a league from shore. The province is traversed through its whole length by the Indus (q.v.), which, approaching the coast, divides and subdivides into a number of channels, forming a delta 75 m. in length; 130 in breadth. This delta, unlike that of the Ganges, is almost destitute of wood, and the soil consists of a mixture of clay, sand, and vegetable mold, which is speedily baked hard by the heat. Along each bank of the Indus is an alluvial tract of great fertility, extending 2 to 12 m. from the river, and mostly irrigated by artificial canals and water-courses, which, overflowing during the inundations, cover the soil with a silt so rich as to yield two, sometimes three, crops in a year. The soil, nevertheless, contains in the n. so much saltpetre, and in the s. so much salt, that after the year's crops have been obtained, these substances are extracted for home consumption and export. Between the Indus and its most easterly branch, the Narra, is an alluvial 'doab,' averaging 75 m. in width, but which, from lack of irrigation, has become almost a desert. East of this, on the other side of the Narra, is the *Thur*, a desert of shifting sand. W. of the Indus the country is occupied by the desert of Shikarpur on the n., a desert not of sand but of alluvial clay, the same as that of the delta, which requires only irrigation to render it fertile; and in the s. it is traversed by the Hala Mts. The *Thur*, or e. desert, has numerous vestiges of former towns—heaps of fragments of bricks and pottery. The climate of S. is remarkably sultry and dry, it being completely beyond the action of the s.w. monsoon; at Haidarabad, the fall of rain in one year was 2½ inches; the

average annual fall at Karatchi does not exceed 6–8 inches, and Larkhana has been known to be without rain three years in succession; the average maximum heat for six months at Haidarabad was 98·5° in the shade, and is still greater in Upper Sind. There are generally two harvests annually; the first, or *rubbî* (spring) harvest, consists of wheat, barley, oil-seeds, millet, durra, opium, hemp, and tobacco; the second, or *kurîf* (autumn) harvest, of those crops whose ripening requires much heat, as rice, sugar-cane, cotton, indigo, maize. The pop. is a mixture of Juts (a Hindu race) and Beluchis, with a few Afghans in the n.w.; the greater portion are Mohammedans, and the remainder, who profess Hinduism, have fallen far from the usual strictness of observance. Generally, the Sindians are tall and handsome; the Beluchi portion warlike and independent; the Juts peaceable and agricultural.

From the time (711) that S. was conquered by the caliph, Abd-ul-Melek, it underwent numerous vicissitudes, forming at times a part of the empire of Delhi, and being latterly (1756) joined to Afghanistan. In 1779, the Beluchis rebelled, deposed their ruler, defeated the Afghans (1786), and raised their leader, chief of the Talpûr tribe, to supreme power. This chief made large grants of territory to various of his relatives, reserving most of Lower S. for himself and his three brothers; so that there were four 'ameers' at Haidarabad, three at Khyerpûr, and one or two at Mirpur. The ameers of S. always regarded the Brit. govt. with suspicion, and occasionally troubled those traders who visited their dominions; but they subsequently concluded and punctually observed commercial treaties. On the outbreak of the Afghan war 1838, the Brit. govt. intimated its intention to take temporary possession of Shikarpûr, and forced the ameers of Haidarabad and Mirpur to agree to a treaty which virtually destroyed their independence. Their expression of natural dislike at this treatment provoked fresh demands from the Calcutta govt., to which the Haidarabad ameers agreed, despite the clamors and threats of their followers, who attacked the Brit. residency on the following day. Sir Charles James Napier, Brit. envoy, at the head of a considerable military force, then marched against the enemy, totally routed them at Meeanee, 1843, Feb. 17; and by defeating the ameers of Mirpur, at Dubba, near Haidarabad (Mar. 24), completed the subjugation of Sind. The conquered territory was divided into three collectorates—Haidarabad, Karatchi, and Shikarpûr; the ameer of Khyerpûr, having continued faithful to the British, retained his dominions. For two years afterward Napier was actively employed in reducing the marauding tribes of the w., who pillaged the province; and so successful was the 'Sheitanka bhai' (Devil's Brother), as the robber tribes named him, that they were completely rooted out of their fastnesses, and most of them transported to distant regions The country is reported as rapidly improving under its present administration.—Pop. (1891) 2,900,000; (1901) 3,210,910.

SINDHU, *sĭn-dŏ'* [from Skr. *syand*, which in its older form probably was *syandh*, to trickle or flow]: ancient name of the river Indus and the country along the Indus or Sindh.

SINDIA, *sĭn'dĭ-a:* powerful family of Mahratta chiefs and princes, conspicuous in the history of India during the 18th and 19th c. The founder of the family was RANOJEE S., a Sudra of the Kûmbi ('cultivator') tribe, who from a menial station in the household of the Peishwa, rose to high rank in the body-guard, and after 1743, received in hereditary fief half of the extensive province Malwa.—His son MADHAJEE SINDIA (1750–94), on the death of Mulhar Rao Holkar (q.v.), became chief of the Mahratta princes, and had command of the Peishwa's body-guard; and 1770 the Peishwa and his two powerful feudatories, S. and Holkar, aided the emperor of Delhi in expelling the Sikhs from his territories, whose administration was given to S. He came into collision with the British; but the war (1779–82) which followed ended with the treaty of Salbye (1782), by which S. was recognized as a sovereign prince, and confirmed in his possessions. In 1784 he captured the stronghold of Gwalior, and in the following year marched on Delhi, to restore his preponderance in the councils of the puppet monarch, and subsequently seized Agra, Allyghur, and nearly the whole of the Doab (q.v.) The advantages of European discipline had impressed him during the war with the British, and, with the aid of a French officer, he introduced it into his own army of 18,000 regular and 6,000 irregular infantry, 2,000 irregular and 600 Persian horse, with 200 cannon. This force, under De Boigne, the officer above noticed, reduced Joudpore, Odeypore, and Jypore, three Rajpût states, and effectually humbled the pride of Holkar.—DOWLUT RAO SINDIA (1794–1827) continued his grand-uncle's policy, and ravaged Indore and Poona, but was routed 1802 by Jeswunt Rao Holkar. Having joined Bhonsla, Rajah of Berar, in a raid on the Nizam (1803), he brought upon himself the vengeance of the E. India Company; the confederated Mahrattas were routed at Assaye and Argaum by Sir Arthur Wellesley; S.'s disciplined troops, under French officers, were scattered irretrievably at Patpergunge (near Delhi) and at Laswari by Lord Lake; and he escaped total ruin only by acceding to a treaty by which all his possessions in the Doab and along the right bank of the Jumna were ceded to the British. Gwalior was, however, restored 1805, and became cap. of S.'s dominions. S. had been taught by his reverses a useful lesson; and he declined to join the attack (1817) on the Brit., and thus escaped the swift destruction which was visited on his turbulent neighbors.—During the reign of BHAGERUT RAO S., a minor, the Gwalior dominions were in such anarchy that the British were compelled to insist on certain guarantees for preservation of tranquillity: war followed the refusal of these, and the Mahrattas were routed at Maharajpûr 1843, Dec. 29, by Lord Gough, and at Puniaur by Maj.gen. Grey, on the same day. Gwalior fell into the hands of the Brit. 1844. Jan 4.

and Sindia submitted to the conditions demanded of him. In 1853, he was declared of age by the East India Company; and 1858 he took the field at the head of his own army against the Gwalior contingent of sepoys, which had joined in the great sepoy mutiny. But the most of his troops deserted him during the battle (June 1, and he narrowly escaped by fleeing to Agra. Sindia was subsequently reinstated by Sir Hugh Rose, and received from the British government numerous testimonials of its grateful respect.

SINE, n. *sīn* [L. *sinus*, a curved surface, a curve: It. *seno;* F. *sein*]: in *Trig.*, the sine of an angle of a right-angled triangle is the ratio of the opposite side of the hypotenuse. If a circle of radius unity is described about the vertex of the angle as center, the sine of the angle is represented by the perpendicular dropped on the initial side from the point where the terminal side cuts the circle. VERSED SINE, *I* less the cosine; represented in the same circle by the distance from the foot of the perpendicular to the point where the initial side cuts the circle. SINICAL, a. *sĭn'ĭ-kăl*, pertaining to a sine.

SINE, *sī'nē* [L.]: a prefix signifying without. SINE DIE, *sī'nē dī'ē* [L. without a day]: without any specified day for reassembling, or for resuming the subject. SINE QUA NON, *kwā nŏn* [L., without which, not]: a phrase used to signify any indispensable condition.

SINECURE, n. *sī'nĕ-kūr* [F. *sinécure*—from L. *sine*, without; *cura*, care]: in *canon law*, a benefice without cure of souls: in general, any office which has an income attached, but little or no employment. A sinecure, in the canon law, is an English eccleciastical benefice, such as a chaplaincy, canonry, or chantry to which no spiritual function is attached, except reading prayers and singing, and where residence is not required. The strictest kind of sinecure is where the benefice is a donative, conferred by the patron expressly without cure of souls, the cure either not existing, or being committed to a vicar. Sinecure rectories have been abolished. SI'NECUR'ISM, n. *-kūr'ĭzm*, the state of having a sinecure. SI'NECURIST, n. *-ĭst*, one who has a sinecure.

SINEW, n. *sĭn'ū* [AS. *sinu;* Dut. *zenuw;* Dan. *sene;* Ger. *sehne;* Icel. *sin*, a sinew]: that which unites a muscle to a bone; a Tendon (q.v.). SINEWS, plu. *-ūz*, strength, or whatever gives strength; muscle; nerve: V. to bind by sinews; to strengthen. SIN'EWING, imp. SIN'EWED, pp. *-ūd:* ADJ. strong; firm; vigorous. SIN'EWY, a. *-ū-ĭ*, consisting of sinews; strong; nervous; vigorous. SIN'EWINESS, n. *-ĭ-nĕs*, the state or quality of being sinewy. SIN'EWLESS, a. *-lĕs*, having no strength or vigor.

SINFUL, SINFULNESS. See under SIN.

SING, v. *sĭng* [AS. *singan;* Ger. *singen*, to sing: Goth. *siggvan*, to sing, to read alone: Dan. *synge;* Sw. *sjunga*, to sing: Skr. *chinj*, to ring, to tingle: Icel. *sangra*, to

murmur]: to utter musical or harmonious sounds (see SINGING); to send forth sweet or melodious sounds, as birds; to chant; to celebrate in song or poetry; in *OE.*, to make a small or shrill noise. SING'ING, imp.: ADJ. uttering musical sounds: N. the utterance of musical sounds (see below). SANG, pt. *săng*. SUNG, pp. *sŭng*. SING'ER, *-ėr*, one whose profession is to sing; one skilled in uttering musical sounds. SINGING-MASTER, n. one who teaches vocal music. SING-SONG, n. *sĭng'sŏng*, a drawling, half-singing tone in speaking: ADJ. drawling.

SIN-GAN FOO', or SINGAN'. See SE-GAN FOO.

SINGAPORE, East India: a British possession consisting of a small island and a strongly fortified seaport city, the capital of the crown colony of the Straits Settlements, off the southern extremity of the Malay Peninsula, commanding the eastern entrance to Malacco Strait, the chief route to the Far East.

The town is well-built, has a sea frontage of about 6 m., and a fine harbor with extensive docks and wharves. It has become the commercial entrepôt of southern Asia and the Indian Archipelago, and carries on such extensive transactions that it has been termed 'the Liverpool of the East.' The port is free to vessels of all kinds and nations, without charges on exports and imports, anchorage, etc., only light dues being payable. Singapore is a coaling station of the British navy, and is defended by forts carrying heavy ordnance, and by submarine mines. The imports from Great Britain comprise cottons (the largest import), iron, machinery, coals, hardware, and various manufactures; the exports thither consist of tin, coffee, rice, sugar, nutmegs, mace, sago, tapioca, catechu, gambier, hides, rattans, gutta-percha, and numerous sundries. The imports from the continent of Europe and the United States consist of wines, spirits, and liquors, manufactured goods, provisions, etc., in exchange for similar commodities to those sent to Britain. Singapore also carries on an extensive trade with Calcutta, Madras, and Bombay. The annual value of exports from and imports into Singapore, taken together, is as much as from $200,000,000 to $250,000,000. A railway has been constructed from Singapore to Kranji, on the Johore Straits. The town is well supplied with water, but in other respects its sanitary arrangements are somewhat backward.

The island of Singapore is of rhomboidal shape, about 27 m. long and 14 m. broad; area, 206 sq.m. It is separated from the mainland by a narrow strait 2 m. to one-half a mile in breadth. Its surface is generally undulating, rising in some parts into round verdure-clad hills, the highest of which, called Bukit-Tima or the Tin-hill, rises 520 ft. above the sea. Tin smelting is the chief of the settlement's industries, more than half of the world's tin product coming from the smelting works of Pulan Brani. The fisheries also are very productive and

give employment to a large number of people. The chief cultivated plants include coffee, pineapples, and other fruits, cocoanuts, aloes, gambier, pepper, indigo, sugar-cane, etc. Fruits and vegetables are grown in immense variety and to great perfection.

After the renewal of the Anglo-Japanese alliance in 1905, the British government acquired by purchase the docks of the Tanjong Pagar Co., to effect the long contemplated project of making Singapore—the key to its command of the seas east of Suez—a first-class naval and military base. The most important docks are Victoria, 467 ft. long, Albert, 485 ft. long, and a graving dock, 800 ft. long. The coaling sheds accommodate 100,000 tons of fuel. Eight forts, including Serapong, 301 ft. above sea-level, command the approaches to Singapore, and are supplemented by a system of submarine mines for harbor defense. Singapore will be increasingly used by British squadrons, and once a year will be the concentrating base for joint manœuvres of the three forces in Chinese, East Indian and Australian waters. The British settlement dates from 1819, when permission was obtained to build a factory on the southern shore of the island. By treaty in 1824 they purchased for 60,000 Spanish dollars and a life annuity to the Sultan of Johore and his resident officer of 24,000 dollars, the sovereignty and fee simple of the island, as well as of all the seas, straits, and islands to the extent of 10 geographical m. (11½ m.) around. Pop. (1901) 228,555 (mostly in the town), including about 3,000 whites.

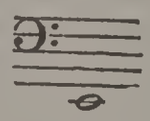
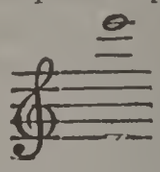
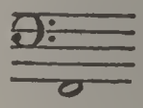
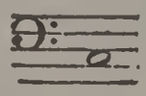
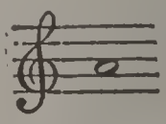
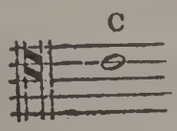
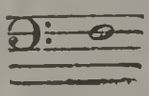
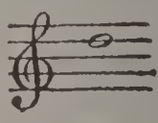
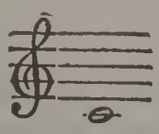
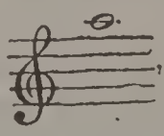
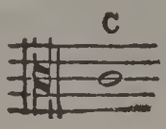
SINGER, Isaac Merritt: American inventor: b. Oswego, N. Y., 1811, Oct. 27; d. Torquay, England, 1875, July 23. He was a machinist, and having spent years of study on the improvement of sewing machines obtained a patent on a single-thread, chain-stitch machine. He established a factory in conjunction with Edward Clark, a wealthy lawyer, and made a fortune in the manufacture of machines which bore his name. He resided at Paris and Torquay during the later years of his life.

SINGH, n. *sĭng* [Punjabi, Hind., etc.]: a lion; used as a title by Rajpoots, Sikhs, etc., as Gholab *Singh*, or more rarely in the names of places, as Sing(h)apore, the city of lions.

SINGHALESE′ (or Sinhalese′ or Cingalese′) Language: the speech of 70 per cent of the native inhabitants of Ceylon. It is an Aryan tongue and nearly allied to Pali, the sacred language of the Buddhists. There is a material difference between the vernacular and the written language. Its alphabet has 50 letters, but these represent only 30 sounds (7 vowels, 23 consonants), belonging to the Singhalese; the other sounds are heard only in Sanskrit words or are indistinguishable. See Ceylon.

SINGHA′RA NUT. See Trapa.

SINGING: art and science of producing music from the human voice, generally, though not necessarily, combined with speech. The mechanism of the vocal organs, as applicable to S., has by some physiologists been likened to a reed, by others to a stringed instrument; in fact, the human voice is produced by an apparatus far beyond either in complexity of structure.

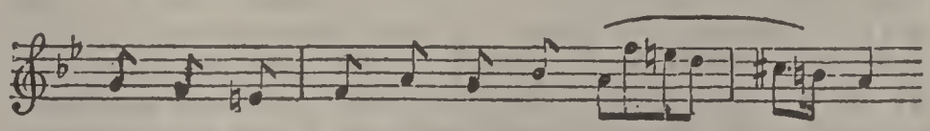
The extreme limits of the voice in respect of pitch may be considered to be from  to  , but the compass of any individual voice is limited to a portion of that range; and voices are classified according to their pitch. Generally male voices are an octave below female. The male are divided into *bass* and *tenor*, the compass of ordinary bass voices being considered to be from  to , and of tenor from  to  For tenor music, the tenor or C clef is sometimes used,  , which has the advantage of having the principal tones within the staff. When the treble clef is used, the music is written an octave above its true pitch. Female voices are either *contralto* (otherwise called *alto*) or *soprano*, the former extending from  to  , the latter from  to  , or sometimes higher. Contralto music may be noted ether on the treble clef, or on the alto clef, which latter is but the tenor clef placed on the third instead of the fourth line of the staff  These are the principal divisions of voices:

but there are further subdivisions. Intermediate between bass and tenor is another male voice, called *barytone;* and intermediate between contralto and soprano, another female voice, called *mezzo soprano.* The ordinary compass of a voice is about 12 notes, but two octaves are frequent, and some voices have reached three. Madame Catalani is said to have possessed a voice of three and a half octaves compass.

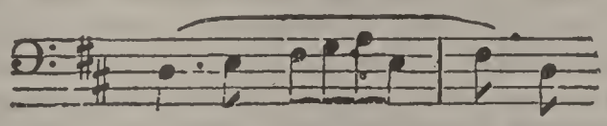
The notes produced in S. are of two kinds, according as they proceed from the chest voice (*voce di petto*) or head voice (*voce di testa*). The chest notes, or lower register, proceed naturally and readily from the ordinary mechanism of the voice; the upper register, head voice, or falsetto, is produced by a more or less forced contraction of the cavity from which the voice proceeds, imparting to the notes a fife-like character, gentle and weak in the male voice, but often clear and sonorous in the female. It is only in the higher notes of the voice that the falsetto is used, and some notes on the borders of the two registers may be given in either. Where the two registers meet, the tones are liable to be hard and uncertain, or weak; but a cultivated singer will blend the head and chest voice at the point of junction so as to make the break imperceptible. The notes of the bass voice are given entirely from the chest. In the tenor, the three or four upper notes belong mostly to head voice. The contralto tones are mostly chest voice, and the upper tones of the soprano are head voice. The alto, when sung by male voices, is principally falsetto.

In S. the head should be held erect, and the chest well expanded, to allow free play to the lungs, and free emission of the voice from the throat. Proper regulation of the breath, and proper articulation of the words, are essential.

One particular requires to be mentioned, in which the notation of songs differs from that of instrumental music. In the latter, two or more quavers or semiquavers may be grouped together by a common line; in S. this can be done only when the whole group are to be sung to one syllable, and notes belonging to different syllables are always written separately. When notes without hooks, or notes not grouped, belong to one syllable, they are bound together by a *slur* placed over them, e.g.:



He shall speak peace unto the hea - - - - - - - - - - then



A - - - - - - - - men

Among the principal objects to be studied in cultivating the voice for singing are the improvement of its quality in clearness and resources; the rendering every note in its compass equally pure; the extension of its compass, not by injudicious forcing, but by gradual practice; and the acquirement of the power to prolong any note with perfect ease. See MUSIC; VOICE; SOLFEGGIO.

SINGLE, a. *sĭng'gl* [L. *singŭli,* one to each, separate; It. *singulo*]: consisting of one only; not double; separate; having no companion; uncompounded; alone; unmarried; done with one only; one on each side, as a *single* combat: honest; pure: in *OE.,* weak; silly: V. to choose one from others; to select, followed by *out;* in *OE.,* to withdraw; to take alone; to separate. SIN'GLING, imp. *-glĭng:* N. the operation of removing superfluous plants from the drill, leaving only single plants at certain distances from one another. SIN'GLED, pp. *-gld.* SIN'GLY, ad. *-glĭ,* individually; only; by himself. SIN'GLENESS, n. *-gl-nĕs,* the being separate from all others; freedom from duplicity; honest plainness. SIN'GLES, n. plu. *-glz,* the reeled filaments of silk twisted to give them firmness. SINGLE-BAR, the cross-piece of a carriage to which the traces of a single horse are fixed. SINGLE ENTRY, in *bookkeeping,* applied to the method of keeping business books by carrying the record of each transaction to the debit or credit side of a single account. SINGLE-HANDED, a. by one's self; alone. SINGLE-HEARTED, a. having no duplicity. SINGLE-MINDED, a. having a single purpose; upright. SINGLE STATE, the state of being unmarried; celibacy. SINGLE-STICK, a cudgel used in fencing or fighting; a certain game with cudgels.—SYN. of 'single, a.': one; particular; individual; alone; unmarried; simple; singular; honest; sincere; separate; uncombined; unmixed; unbiased; unprejudiced.

SINGLE TAX: a tax levied upon the value of land, irrespective of the value of improvements, and so regulated as to equal the economic rent, or 'unearned increment' of land. By taking the full rent of land, the government would in effect assume the ownership and become sole landlord. The primary principles of the single tax were enunciated by the Physiocrats, French political economists of the 18th c., but Henry George was the first to fully develop the theory in his *Progress and Poverty* (published 1879), which made the question of the single tax an issue in modern politics and political economy. Accepting the 'classic' law of rent, that 'the rent of land is determined by the excess of its produce over that which the same application can secure from the least productive land in use,' he derives as the law of wages that 'wages depend upon the margin of production or upon the produce which labor can obtain at the highest point of natural productiveness open to it without payment of rent,' and as the law of interest that 'the relation between wages and interest is determined by the

average power of increase which attaches to capital; as rent rises interest will fall as wages fall, that is, will be determined by the margin of cultivation.' Thus the economic basis of the single tax theory is that wages and interest in the last analysis are determined not by the productiveness of labor and capital, but by the value of land, and that as land becomes more valuable (that is, the economic rent greater), wages and interest will become relatively less. Therefore the only way to prevent the landowners alone from reaping the benefit of increase in the value of land to the detriment of labor and capital, is to make land common property; and this is best accomplished by society's appropriating all rent in the form of taxation, and thus obtaining for society the full benefit of increase in land values. The single tax is also defended on the grounds of justice, and expediency as a method of taxation. (1) From the point of view of justice, the right of private ownership is given by labor only, and as land is in no way a product of man's labor, it should not properly be owned by individuals, but equally shared in by all, and as the value of land, according to the law of rent, is not absolute, but relative to the best land which may be had for the using; and the increase in value depends upon increase in population and general improvement in the arts and sciences, this increase in value should properly belong to society, as not the result of any individual's labor. (2) As a method of taxation the single tax has the advantage of not bearing upon production because the value of land is not a product of any man's labor, but rather makes speculative rent impossible and the holding of land not in use unprofitable, so more land would be thrown open to the use of producers; another advantage is that such a tax can be easily collected, for land cannot be concealed, but the value can be easily ascertained, and with the assessment once made comparatively few officials would be necessary to collect this one tax; and also it bears equally on all, for it takes for the community what is the creation of the community. The benefits to society claimed for the single tax are as follows: (1) It would stimulate production by removing all hampering taxes from productive industries, and, as has been said, by preventing the holding of land for speculation, not for use; (2) that the distribution of wealth would be more equal, because the natural increase in the value of land resulting from natural laws would be taken by the community and would be shared in by all, and the unnatural increase in value caused by private monopoly and speculation would be prevented; (3) it would finally result in the increase of social wealth so that want would be abolished, and an advance in civilization made possible which is impossible under present conditions.

Objections to the Theory.—The objections to the single tax come from two parties: (1) those who believe in private property in land; (2) the Socialists, who claim

the single tax is only a half way measure. By the conservative element the arguments are advanced: (1) that the single tax is based on a false idea of justice, because landowners have purchased land with the results of their labor and have as much right to their property as if they had put the results of their labor into some other form of property; that therefore the single tax upon land values would practically distinguish between forms of labor, and would therefore be unjust, and, from an economic point of view inexpedient; (2) that the single tax is impractical because it would not raise sufficient revenue; (3) that the sense of private property in land was the very beginning of civilization, and has always been a great civilizing influence, 'the keystone of society,' and to practically destroy this would be to weaken the very foundations of society. The Socialists, on the other hand, claim (1) that landowner and capitalist unite to oppress the laborer and rob him of the full produce of his labor, and that both land and capital should be the property of society; (2) that the same argument of justice which applies to society's taking control of the land, may be applied to taking control of capital at the present state of civilization, since the machinery and immense establishments of the present day are really not the product of the labor of any individual, or of a few; (3) and that therefore the single tax would be at best only half a solution of the problem, and would not greatly benefit the working class.

The Single Tax Movement.—The principles of *Progress and Poverty* were slow in gaining adherents in the United States; but George continued writing and enforcing his views with such vigor and sincerity that he aroused the interest and enthusiasm of many political reformers, and a considerable body of workingmen. The first and most important political contest in which the Single Taxers engaged was in New York in 1886, when George was nominated for mayor by the United Labor party on a single tax and labor platform, and received a large number of votes. Local single tax leagues and clubs were organized in many states, and many large cities; the National Single Tax League met at New York in 1890 and adopted a full declaration of principles prepared by George himself. Since George's death in 1897 the single tax movement has lost in numbers of its adherents, and in political influence. Many of the single tax organizations persist, and are centers of propaganda by means of public discussions and the dissemination of literature. The *Single Tax Review* is published in New York by Joseph Dana Miller in the interests of the movement. In 1896 a single tax community was established at Fairhope, Ala., by an association of five men, the number having increased to 65 in 1903. The distinctive feature of the colony's policy is of course its system of land tenure. The association owns 1,200 acres of land, including the village site, on the beach, and back to farm

lands in the rear. Not a foot of this land has been or will be sold. Holdings are rented on a 99-year lease. This eliminates land speculation from the first, there being no inducement to rent and hold land from which there is no opportunity to make a profit by selling when values have increased. A man who has improved his land may sell the improvements, but he does not sell the land. The rents are based on the advantages of location, and range from 20 cents an acre per year for farm lands in the rear to $25 for business lots in the center of the village. From the rentals the association pays first all the state taxes of all tenants, except those on moneys and credits. The remainder is applied to the expense of conducting the colony and to furnish better roads, schools and all sorts of public service that the colony would otherwise get. The community runs its wharf, steamer, and waterworks. Dissatisfaction and complaints have arisen at times, but the association has been able to meet them in such a way that the colony has grown.

Consult: George, *Progress and Poverty; The Land Question; Social Problems;* Miller, *Progress and Robbery;* Seligman, *Essays in Taxation;* Simons, *Single Tax vs. Socialism;* Smart, *Taxation of Land Values and the Single Tax.*

SING SING, *sĭng'sĭng:* former name of a village in Westchester co., N. Y., now called Ossining; on the Hudson river, and on the New York Central & Hudson River railroad; 33 m. n. of New York. It affords a grand panorama, overlooking the river, the Palisades, Highlands, Tappan and Haverstraw bays, several villages, and many spots of historical interest. The village is noted for its beautiful residences, many of them the summer-homes of New York business men, and as the location of a famous state-prison for both sexes, begun 1825, and built of white limestone. There are several churches, public and private schools, 1 Roman Catholic school, several schools for preparing boys for the U. S. Military Academy, seminary and several institutions for young ladies, banks, and weekly and monthly periodicals. The industries comprise foundry and machine-shop products, lime, files, stoves, gas and water pipes, hats, cotton-gins, steam-engines, carriages, and sleighs. Skilled labor is now prohibited in the prison. The name Sing Sing, which had become synonymous with prison was changed to Ossining in 1901. Pop. (1900) 7,939; (1910) 11,480.

SINGSPIEL: a kind of operatic production introduced by Johann Adam Hiller, which became very popular in Germany during the latter half of the 18th century. Hiller introduced modern characters in these productions and imitated the style of music common to the older folk-songs. His simple airs were dedicated to the lower classes while the arias were written for persons of rank. Besides Hiller, there were many other composers of this class of music, including Haydn, Kauer, Schenk, Schweitzer, Neefe, Reichardt, Dittersdorf, etc.

SINGULAR, a. *sĭng'gū-lĕr* [L. *singulāris*, single, solitary —from *sin'gŭli*, one to each: F. *singulier*, singular]: not complex or compound; expressing only one person or thing; not plural; proper or individual. as a *singular* term; remarkable; unexampled; of which there is but one; rare, unique; uncommon; peculiar; odd, expressing disapproval strange. SIN'GULARLY, ad. *-lĭ*. SIN'GULARITY, n. *-lăr'ĭ tĭ*, some character or quality of a thing by which it is distinguished from others; peculiarity; particular privilege or distinction; eccentricity; oddity. SINGULAR PROPOSITION, in *logic*, one which has for its subject a singular term, or a common term limited to one individual. SINGULAR SUCCESSOR, in *Scotch law*, one who succeeds to ownership of property by purchase or otherwise than by descent. SINGULAR TERM, in *logic*, a term which stands for one individual.—SYN. of 'singular': unexampled; unprecedented; remarkable; uncommon; strange; fantastic; odd; eccentric; eminent; extraordinary; unusual; rare; single; one; particular; alone.

SINICAL: see under SINE 1.

SINIGAGLIA, *sē-nē-gâl'yâ*, or SENIGALLIA, *sā-nē-gâl'lē-ô* (anc. *Sena-Gallia*): city and seaport on the e. coast of Italy, province of Ancona, 17 m. w.n.w. of the city of Ancona, at the mouth of the Misa. It is a bright, cheerful city, built in modern style, walled round; and it has bastions and handsome gates. It has a modern cathedral, and a large Jewish synagogue. S. is famed for its annual fair, July 20 to Aug. 10, which sometimes puts in circulation about 60 million francs in 20 days. This fair dates from A.D 1200. English, French, Swiss, Americans, Germans, etc., attend it. S. was founded by the Senonian Gauls, and colonized by the Romans B.C. 289.—Pop. (1881) exclusive of suburbs 6,634, commune 22,499.

SINISTER, a. *sĭn'ĭs-tĕr* [L. *sinister*, on the left hand or side: It. *sinistro:* F. *sinistre*]: on the left; evil; corrupt; dishonest; inauspicious: in *her.*, denoting the left side of the escutcheon in respect of the bearer (see POINTS OF THE ESCUTCHEON). SIN'ISTERLY, ad. *-lĭ*. SIN'ISTRAL, a. *-trăl*, belonging to the left hand; having spiral turns toward the left. SIN'ISTRALLY, ad. *-lĭ*. SIN'ISTROUS, a. *-trŭs*, being on the left side, or inclined to it; wrong; absurd. SIN'ISTROUSLY, ad. *-lĭ*. BAR SINISTER: see BAR. *Note.*—In *her.*, the accent of SINISTER is usually on the second syllable, thus, *sĭn-ĭs'tĕr*.—SYN. of 'sinister': left; bad; perverse; corrupt; dishonest; unfair; unlucky; inauspicious.

CI, sinister side; *C*, sinister chief; *I*, sinister base.

SINISTRORSAL, a. *sĭn'ĭs-trŏr'săl* [L. *sinistror'sus*, toward the left side—from *sin'ister*, on the left hand; *versus*, turned—from *vertĕrĕ*, to turn]: rising from left to right. SIN'ISTRORSE, a. *-trōrs*, in *bot.*, applied to a spiral directed toward the left.

SINK, v. *sĭngk* [Goth. *siggquan;* Icel. *sökkva;* Ger. *sinken;* Dan. *synke;* Sw. *sjunka,* to fall to the bottom. AS. *sincan,* to sink]: to fall or go downward, as in water or mud; not to swim; to go to the bottom; to diminish in quantity; to subside; to lose or want prominence; to be overwhelmed or depressed; to penetrate into any body; to penetrate the mind or understanding; to settle to a level; to fall or retire within the surface of anything; to immerse in a fluid; to depress; to make to fall; to degrade; to crush; to dissipate; to make by digging, as a well or pit; to surrender capital permanently for the sake of large interest; to invest money more or less permanently in any undertaking, as in the building and plant of a manufactory; in *OE.*, to suppress; to conceal: N. an open box of wood lined with lead, or one of stone, with a pipe in the bottom for carrying off superfluous or dirty water; that under which anything sinks or descends; that in which corruption, physical or moral, is gathered; a drain; a kennel. SINK'ING, imp. SANK, pt. *săngk,* did sink. SUNK, pp. *sŭngk,* penetrated into; settled to a level; subsided. SUNKEN, a. *sŭngk'ĕn,* lying on the bottom of a river or harbor, or other water. SINKER, n. *sĭngk'ĕr,* he who or that which sinks; a weight used to sink a net or fishing-line. SINKING FUND: see FUND.—SYN. of 'sink, v.': to drop; fall; tumble; droop; flag; languish; pine, subside; descend; decline; lower; decay; decrease; lessen; reduce; waste; depress; degrade; crush; overbear; diminish.

SINLESS, SINLESSNESS. see under SIN.

SINOLOGUE, n. *sĭn'ō-lŏg,* or SINOLOGIST, n. *sĭn-ŏl'ŏ-jĭst* [F. *sinologue,* a student of Chinese—from Ar. *Sin,* for *Chin,* the empire of China; *Sinim,* the Chinese; Gr. *logos,* discourse]: one who devotes himself to the scientific study of the Chinese language and literature. SINOLOGY, n. *sĭn-ŏl'-ŏ-jĭ,* the study of the Chinese language and kindred subjects.

SINOPE, *sĭn-ō'pē* (Turk. *Sinub*): a town of Asiatic Turkey, province of Anatolia, on the s. side of a little promontory jutting e. into the Black Sea, 80 m. n.w. of Samsun. S., which is defended by some half-ruined fortifications, has a dock-yard and naval arsenal; and exports timber, dried fruits, tobacco, bay-leaves, and oil. The bay of S., which affords the finest anchorage for ships along the whole n. coast of Asiatic Turkey, and is the finest natural harbor except one, on the Black Sea, was the scene of a bloody naval engagement, or rather massacre, 1853, Nov. 30, when a Turkish squadron of 13 ships was suddenly attacked and destroyed by the Russian fleet. Of the ancient city of S., founded by a colony of Milesian Greeks, and for 200 years after the Peloponnesian war, almost the mistress of the Euxine, numerous ruins still exist, 'friezes, hundreds of Corinthian columns, capitals, sculptures, inscriptions, and even statues, built up into the walls of its picturesque Byzantine fortifications.' S. was the birthplace of Diogenes the cynic.—Pop. about 10,000, nearly three-fourths Mohammedans

SINOPER, n. *sĭn'ō-pĕr*, or SIN OPLE, n. *-pl* [L. and Gr. *sinōpis*, kind of red ochre found near *Sinōpē*, now called *Sinub*]: a ferruginous quartz or jasper, of a blood or brownish red color. SIN OPLE, n. in *her.*, continental term for the color green (see VERT). SINOPIA, n. *sĭ-nō'pĭ-ă*, or SINOPITE, n. *sĭn'ō-pīt*, fine red pigment, much used by the ancients.

SINTER, n. *sĭn'tĕr* [Ger. *sinter*, dross, sinter; *sintern*, to drop, to petrify]: compact incrustations from siliceous or calcareous springs. S. deposited from hot springs is usually siliceous, that from cold springs is frequently calcareous. S. formations are recent, belonging to the strata at present in course of formation. S. is of various forms; kidney-shaped, knotted, tuberous, botryoidal, tubular, stalactitic, shrub-like, or pronged: and is occasionally distinguished by its chief component as Calcareous or Calc S., Flint or Quartz or Siliceous S., Iron S., etc. S. is distinguished from *tuff* or *tufa*, which is open and porous, by returning a hard ringing sound to the hammer. Calcareous S., a variety of carbonate of lime, composed of concentric plane parallel layers, appears under various forms; it is deposited with extraordinary rapidity by many springs, a peculiarity frequently used to obtain the incrustation of objects with a coating of this substance. Quartz S. is found mostly in intermittent hot springs, e.g., the Geysers (q.v.) of Iceland. Iron S. occurs in old mines, and in coal-beds, where it is formed from iron pyrites through the agency of the atmosphere. The tubular conglomeration of grains of sand half-melted by lightning (*blitz*) is known as Blitz-S., or Fulgurite (q.v.). In Italy calcareous S. is used as a building stone, under the name TRAVERTINE (q.v.). Pearl S. is a variety of opal of pearly lustre.

SINUATE, a. *sĭn'ū-āt* [L. *sinŭātus*, swelled out in curves; *sinuārĕ*, to curve—from *sĭnus*, a bent surface, a curve: F. *sinué*, having sinuses or incisions]: in *bot.*, cut so as to have a broken and wavy margin—applied to the margin of a leaf: V. to wind; to bend in and out. SIN'UATING, imp. SIN'UATED, pp. SIN'UA'TION, n. *-ā'shŭn*, a winding or bending in and out. SIN'UOUS, a. *-ŭs*, or SIN'UOSE, a. *-ōs* [F. *sinueux*—from L. *sinŭōsus*, full of bendings or windings]: wavy; bending in and out; undulating. SIN'UOUSLY, ad. *-lĭ*. SIN'UOS'ITY, n. *-ŏs'ĭ-tĭ*, the quality of winding in and out; a series of bends and turns

Sinuate Leaf.

SINUS, n. *sī'nŭs*, a bend or recess in the coast: in *anat.*, a cavity or irregular channel in a bone (see below): a dilated form of vein: in *surg.*, an elongated cavity containing pus (see FISTULA): in *bot.*, the indentation or recess formed by the lobes of leaves; a groove or cavity. SINUSES, n. plu. *sĭn'ū-sēz*, hollows or cavities, as in the bones, or in the dura-mater.

SI'NUS: term with two significations in Anatomy, and one in Surgery.—In anatomy, the cells or cavities in certain bones—e.g., the frontal, ethmoid, sphenoid, and superior maxillary—receive this designation. The frontal sinuses are two irregular cavities extending upward and outward, from their openings on each side of the nasal spine, between the inner and outer layers of the skull, and separated from one another by a thin bony septum. They give rise to the prominences above the root of the nose called the nasal eminences. They are not developed till after puberty, and vary considerably in size, being usually larger in men than in women and young persons, because of the greater prominence of the superciliary ridges in the former. When very much developed, they give a receding appearance to the forehead. They are larger in Europeans than in negroes, and are very imperfectly developed in the Australians, whose peculiar want of vocal resonance is apparently due to the deficiency. They communicate on each side with the upper part of the nostril by a funnel-shaped opening, which transmits a prolongation of mucous membrane to line their interior. These cells are much more highly developed in certain mammals and birds than in man. Prof. Owen observes that 'they extend backward over the top of the skull in the ruminant and some other quadrupeds, and penetrate the cores of the horns in oxen, sheep, and a few antelopes. The most remarkable development of air-cells in the mammalian class is presented by the elephant; the intellectual physiognomy of this huge quadruped being caused, as in the owl, not by the actual capacity of the brain case, but by the enormous extent of the pneumatic cellular structure between the outer and inner plates of the skull.' The sphenoidal sinuses are two large irregular cavities, formed, after the period of childhood, in the body of the sphenoid bone: they communicate with the upper part of the nose, from which they receive a layer of mucous membrane. Like the frontal sinuses, they serve to lessen the weight of the skull, and to add to the resonance of the voice. The ethmoid sinuses or cells lie in the lateral masses of the ethmoid bone: they open into the cavities of the nose. Their main use is to diminish the weight of the fore-part of the skull. The superior maxillary sinus commonly known as the *Antrum of Highmore* (the anatomist who first accurately described it) is the largest of the facial sinuses.

The *sinuses of the dura-mater* are quite distinct from the above-described bony sinuses; they are irregular channels for the transmission of venous blood, and are formed in the following way. The dura-mater consists of two layers—an outer, belonging to the skull, and an inner, belonging to the brain. They can be easily separated in infancy, but in the adult they are blended together for the greater part of their extent. In some places, however, as beneath the sagittal suture (formed by the two parietal bones at the top of the head, and running from before

backward), they are separated on either side of the mesial line, the outer layer being continued beneath the bone, and in contact with it; while the inner one dips inward, and meeting with the corresponding layer of the opposite side, forms a triangular canal or sinus, strengthened at the sides and angles by interlacing bands of fibrous tissue. The sinus whose formation we have thus described is called the superior longitudinal sinus, and the other sinuses are formed in the same way. They all are lodged in the intervals between the great divisions of the brain, and they are so constructed 'that their shape cannot easily be altered by any external pressure; consequently, the flow of blood through them cannot be impeded by the pulsations or pressure of the brain, in the varying positions of the body. The tense, unyielding character of their walls, moreover, does not admit of either collapse or distention; hence, they must be equally full at all times, and must exert a uniform pressure on the brain.'—Humphry *On the Human Skeleton*, p. 200.

In surgery, the term *sinus* is nearly equivalent to *Fistula* (q.v.).

SION, *sē-ōng'*: small town of Switzerland, cap. of the canton of Valais, in a picturesque situation on the right bank of the Rhone, 18 m. n.e. of Martigny by the Simplon railway. It is defended by walls, towers, and a ditch; and contains a large cathedral, a handsome Gothic town-house, a Jesuits' convent, and an ancient prison. N of the town is a lofty rock, divided into two peaks by a deeply cut ravine: on the highest peak is the ruined castle of Tourbillon, built 1294; on the other, the castle of Valeria, now used as a seminary. An excellent wine, called Malvoise, is made here. S. is called *Civitas Sedunorum* in an inscription in honor of Augustus, still seen in the cathedral: in the middle ages it was named *Sedunum*.—Pop. 5,000.

SIOUT, *sē-ôt'*, or ASYOOT, *â-sē-ôt'*, or ES SIOÛT, or OSIÛT: chief city of Upper Egypt, near the w. bank of the Nile, 200 m. in direct line s. of Cairo. It has several fine mosques, bazaars almost as well furnished as those of the capital, some good baths, and one or two well-built houses. S. manufactures great quantities of the best pipe bowls. It is the residence of the gov. of Upper Egypt; the resort of the caravans from Darfur, that come by the way of the Great Oasis; and until recently was the principal seat of the Egyptian slave-trade. S. is built on the site of the anc. Lycopolis, but few remains of the Græco-Egyptian city are extant. From the neighboring heights of the Libyan mountains, which contained numerous rock-sepulchres, the view over the valley of the Nile is, in the opinion of Lepsius, the finest in Egypt.—Pop. about 25,000.

PANORAMA OF ASSIOUT.

SIOUX, *sōz*, or DAKOTAS, *da-kō'taz:* group of Indian tribes, inhabiting, when first visited by the French, what is now n. Minnesota. Jean Duluth first claimed their country for France 1680, followed by Nicholas Perrot, who fortified a position at Lake Pepin 1689. As reported by Le Seur, there were 16 bands or tribes at that time, with whom and the Foxes the French had some conflicts. In subsequent Indian war the S. were driven south, spreading as far as the lower and upper Missouri river; and they have been in later years grouped with a family race, including the Assiniboines, Winnebagoes, Omahas, Iowas, Kansas, and Crows. In the war of 1812 the S. were allies of Britain. The region occupied by them in the first part of this c. was from the Mississippi to the Black Hills, and from Devil's Lake, in the centre of n. Dakota, as far s. as the present Sioux City. Their lands e. of the Mississippi were bought, 1837, by the United States for $300,000; and 1851 all e. of nearly the present w. boundaries of Minn. and Io., except a reservation of 2,800 sq. m.—the rate paid being about $1 per acre. The usual failure to meet stipulations led to unfriendly feelings; and an outbreak occurred when, 1854, on the attempt of Lieut. Grattan to arrest an Indian, he and his force were killed. After many conflicts Gen. Harney enforced peace the next year. But other outbreaks followed, such as the bloody massacre of nearly 50 settlers at Spirit Lake, Io., 1857, and others in Minn. 1862. Deeming themselves wronged by the govt. and its agents, the S. entered on a general war, at the cost of a thousand lives of the whites. Gens. Sully and Sibley conquered the tribes of the Missouri river region; and of more than a thousand captives, 39 were hung for proven crimes. The prisoners were sent to Davenport, Io., where they were cared for by the benevolent Col. Davenport (founder of the city), whom they worshipped as their friend. The S. reservation was afterward the w. half of the present S. Dak., beyond the Missouri river. The treaty of Gen. Sherman 1868 was opposed after gold was discovered in the Black Hills. The 'Messiah craze' of 1890 was the occasion of a rising of the S. in N. Dakota, and a massacre by U. S. soldiers.

Rom. Cath. missions were established among the S. 200 years ago; and Prot. missions in later times. No more thorough missionary work has ever been done among the Indians, than by Stephen R. Riggs, D.D., LL.D., and his assistants of the Amer. Board missions to the S. tribes; his *Grammar and Dictionary of the Dakota Language* forms a 4to vol. of the Smithsonian Contributions to Knowledge; and he has published numerous school and religious books in the language.

The S. are now distributed on different reservations in Montana, Nebraska, N. and S. Dakota, and number (1899) 20,865.

SIOUX CITY.

SIOUX CITY, *sô:* city, cap. of Woodbury co., Io.; on the Missouri river, and on the Chicago, Milwaukee and St. Paul, the Chicago, St. Paul, Minneapodis and Omaha, the Ill. Central, the Pacific Short Line, the Sioux City and Northern, the Sioux City and Pacific, and the Union Pacific railroads; 100 m. n. of Omaha, 270 m. s.w. of St. Paul, 544 m. w. of Chicago; 39 sq. m.; known as 'the Corn Palace City.' S. was a trading post, was incorporated 1856; and 1906 had net public debt $1,124,-100; assessed val., tax, prop. $24,342,153; tax rate $8.80 on $100. Its growth has been remarkable, due to its exceptional railroad facilities, water communications, varied and extensive industries, and to the activity and liberality of its business men. It is 1,100 ft. above sea-level; is handsomely laid out, with broad streets crossing each other at right angles; is supplied with water from the river by a system completed 1885; has a perfect system of sewerage; is lighted by gas and electricity. An elevated railroad system was completed for use in 1891. The Missouri river is here crossed by several bridges for railroad and general purposes, the principal one 2,000 ft. long, costing about $2,000,000, and free to all railroads entering the city. A pile and pontoon summer bridge was built by the Pacific Short Line road 1890, and a more costly one for general purposes was begun by the same road 1891. The city is in the heart of a great corn-growing region, and more than one-half of the entire flaxseed product of the United States is grown within 125 m. of it. The city contains many notable public buildings. It is the seat of Morningside College and S. C. College of Medicine. There is a federal building, capacious union depot, a Y. M. C. A. building, police building, public library, court-house, city hospital, St. Joseph's hospital, city hall, more than 50 church buildings, large public school buildings, business colleges and nearly a score of banking institutions.

S. C. is the commercial and industrial centre of N. W. Iowa, N. E. Nebraska and the S. E. part of S. Dakota. It has extensive steamer connection with Missouri river points, and trolley lines to all suburbs. There are grain elevators, stock and lumber yards and many wholesale houses. The industries are carried on in numerous packing houses, foundries and machine shops, railway repair shops, boiler and sheet iron works, breweries, harness and saddlery factories, brick yards, linseed oil and flour mills. There are also factories for making stoves, furniture, agricultural implements, clothing, shoes, carriages and wagons, soap and starch, and tiling. Many large creameries are operated in the city and vicinity.

The annual shipments from S. C. are chiefly flour, packed meats, grain and the manufactured products of the city, which is surrounded by a rich agricultural district and is in an important mining region. S. C. was

settled in 1849 by traders. They introduced the famous 'Corn Palace' exhibitions which have since given place to inter-state fairs. The city has several national, state and private banks, and a number of incorporated associations.

There are churches of all the religious denominations, and many religious and charitable associations. The oldest church organization is the 1st Presb. (1857, Aug. 2), the next the 1st Congl., just one week younger. Public education is well organized and of a high grade. A site (cost $75,000) was bought for a public high-school building 1890. Superior instruction is provided by the Morningside Col. (Meth. Episc.), which was organized early in 1890, erected its first building (college of technology) in the summer, laid the corner-stone of its main building (college of liberal arts) Sep. 8, and opened its first term Sep. 17. The institution has a campus of 10 acres, a library of 6,000 volumes, a college of liberal arts, with classical, philosophical, scientific, and literary courses; and colleges of music, theol., medicine, pharmacy, dental surg., law, technology, practical economics, agriculture, and commerce. The Rev. Wilmot Whitfield, D.D., was elected the first pres. of the inst. Excellent instruction is also provided in St. Mary's Convent School (Rom. Cath.), for which a new building, costing $23,000, was erected 1890. There are also two hospitals, several homes and asylums, a public library, and daily and weekly papers.

The first corn palace, a notable structure ornamented with stalks, husks, and ears of corn, and costing $30,000, was erected 1887. In 1888 a palace 150 ft. sq. was built at a cost of $60,000. The palace of 1889 was 240 x 120 ft. in dimensions, with a tower in the centre 200 ft. high, and that of 1890 was an elaborate oriental palace, 264 ft. sq., with large and high rotunda, tower 172 ft. high, auditorium with seating capacity of 1,200, band-stand, promenade, galleries, and innumerable attractions. Five in all were erected. Interstate fairs are held in Riverside Park. Pop. (1910) 47,828.

SIOUX FALLS, *sô:* city, cap. of Minnehaha co., S. D.; on the Big Sioux river, and on the Chicago St. Paul Minneapolis and Omaha, the Chicago Milwaukee and St. Paul, the Burlington Cedar Rapids and Northern, the Illinois Central, and the St. Paul Minneapolis and Manitoba railroads; 190 m. n. of Omaha, 240 m. s. w. of St. Paul, 553 m. n.w. of Chicago. It is in an undulating prairie region; has exceptional water-power from the river, which falls 110 ft. in ½ m.; and possesses great natural wealth in inexhaustible quarries of magnificent jasper-stone. The city contains about 50 m. of streets; water-works, gas-works, electric lights, street railroads, and a public park, comprising a large forest-clad island, at the head of the falls, overlooking the cascades. The churches include Bapt., Congl., Free Bapt., Free Meth.,

Meth. Episc., Norwegian Luth., Presb., Prot. Episc., Ref., Rom. Cath., Swedish Bapt., Swedish Luth., Seventh-day Adventist, and Unitarian; value of church property $264,000. The public school prop. cost $350,000, and the pupils enrolled in 1901 num. 2,227; teachers 52. There are 4 col.—All Saints' (Prot. Episc.), Sioux Falls Univ. (Bapt.), St. Rose's (Rom. Cath.), and Norwegian Normal Univ.; 1 business college; and 7 public-school buildings. The city has national and savings banks, incorporated and private banks; daily, weekly, and monthly periodicals. The industries comprise the manufacture of brooms, blank-books, bricks, beer and ale, confectionery, cigars, cheese and butter, flour and feed, foundry and machine-shop products, sorghum. furniture, wagons and carriages, besides quarrying and stone polishing. Pop. (1900) 10,266; (1910) 14,094.

SIP, v. *sĭp* [related to *sap, sop, sup*, representing the sound of a liquid in sucking or agitating in a confined space: Dut. *zuipen*, to sup up: O. Dut. *sippen*, to take small draughts]: to imbibe in small quantities with the lips; to drink or taste in small quantities; to suck up; to drink out of: N. a small draught; as much as the lips take up at one movement. SIP'PING, imp. SIPPED, pp. *sĭpt*. SIP'PER, n. *-per*, one who sips.

SIPE, v. *sīp* [AS. *sipan*, to distil: prov. Ger. *sijpen*, to ooze out]: in *prov. Eng.*, to ooze or drain out slowly. SIPING, imp. *sīp'ĭng:* N. act of oozing. SIPED, pp. *sīpt*.

SIPHILIS: see SYPHILIS.

SIPHON, n. *sī'fŏn* [F. *siphon*—from L. *sipho* or *siphōnem*, a hollow reed—from Gr. *siphōn*, a small reed]: a bent pipe or tube whose arms are of unequal length, used chiefly for drawing off liquids from casks, etc. (see below): N. PLU. the respiratory tubes in the mollusca; tubes of different functions. SIPHONIC, a. *sī-fŏn'ĭk*, pertaining to a siphon. SIPHON-BAROMETER, barometer in which the lower end of the tube is bent upward like a siphon. SIPHON-GAUGE, glass siphon filled partly with mercury, used to indicate the degree of rarefaction produced in the receiver of an air-pump. SIPHONIA, n. *sī-fō'nĭ-ă*, in *geol.*, genus of fossil sponges, having a pear-shaped body mounted on a slender stalk, occurring abundantly in the chalks and greensands of Europe. SIPHONIFEROUS, a. *sī'fŏn-ĭf'er-ŭs* [L. *fero*, I bear]: having a siphon or siphuncle within a polythalamous shell. SIPHO'NIUM, n. *-nī-ŭm*, bony air-tube in some birds.—*Siphon* is a tube bent so that its two legs, usually of unequal length, are either parallel or incline at an acute angle; used to draw off liquids from vessels which it is not desirable to move. If the end of the short leg of a S. be plunged into the liquid, and the other leg be suffered to hang outside the vessel, then, whenever the S. is exhausted of air (a process which can

be performed by suction by the mouth or a pump, or by filling the tube with the liquid which it is employed to decant, and keeping it so filled till it is placed in its proper position), the liquid will at once flow out of the vessel through the tube, and continue to flow either till it falls below the level of the outside end, or till the inside end ceases to be immersed. The principle of this simple and efficient instrument is easy of explanation: let ABC (fig.) be a S. with one leg, BC, partially immersed in liquid, and suppose the whole S. filled with the same liquid; then at A the pressure of the atmosphere is acting upward into the tube in opposition to the pressure of the liquid in the leg BA; at C the pressure of the atmosphere (transmitted through the liquid), and the pressure of the liquid in the vessel outside (which balances an equal height of liquid inside) the tube, is acting upward into the tube in opposition to the pressure downward of the liquid in the leg BC. The effective pressures inward at A and C are, respectively, the atmospheric pressure less by the pressure of the liquid in BA, and the atmospheric pressure less by the pressure of the liquid in BD; and as the latter of these two is the greater, it overcomes the other, forces the liquid in the tube out at A, and that in the vessel into the tube at C, the process continuing till the liquid falls to the level of C (thus admitting air), or of A (when the two pressures become equal). It is evident from the above explanation that when A is on or above the level of D, the surface of the fluid, there can be no flow through the tube; also, that it is quite immaterial whether the longer or the shorter leg be immersed, if only A be below the level of D. If the bend of the siphon be 33 ft. for water, or 30 inches for mercury, above D, the pressure at C, which produces the action of the S., becomes the weight of the atmosphere, diminished by an equal weight of a column of fluid, in which case the resulting pressure is zero, and there is no flow through the tube. The flow increases in rapidity and force as the difference of level between D and A increases, and as the difference of level between D and B diminishes. Many siphons have a suction-pump permanently attached to the end of the outer leg for exhausting the air inside. Another variety is the *Wirtemberg siphon*, which has two equal legs, the extremities of which are bent upward, so that when the S. is once filled with fluid, it remains full, and is always ready for use.

Siphon.

SIPHONO-BRANCHIATE, a. *sī'fŏn-ō-brăng'kĭ-āt* [Gr. *siphōn*, a siphon; *brangchĭă*, gills]: having a tube by which water is carried to the gills.

SIPHONOPHORA, n. plu. *sī'fŏn-ŏf'ō-rā* [Gr. *siphōn*, tube; *phoros*, bearing]: a division of the Hydrozoa.

SIPHONOSTOMATA, n. plu. *sī'fŏn-ŏ-stŏm'ă-tă* [Gr. *siphōn,* tube; *stoma,* mouth]: large group of gasteropodous mollusks of order *Pectinibranchiata,* having the mantle prolonged into a siphon, by which the water enters the gill chamber. The shell is spiral, the aperture notched or produced into a canal in front, often much prolonged. Almost all are carnivorous, and move about with considerable activity.

SIPHUNCLE, n. *sī-fŭng'kl* [L. *siphun'cŭlus,* a little pipe—from *sipho,* a siphon (see SIPHON)]: any small tube or tubular passage; the tube-like perforation which passes through the septa and chambers of such shells as the nautilus, the ammonite, etc. SIPHUN'CLED, a. *-kld.* having a siphuncle. SIPHUN'CULAR, a. *-kū-lėr,* pertaining to a siphuncle. SIPHUN'CULATED, a. *-lā-tĕd,* furnished with a little siphon or spout.

SIPPET, n. *sĭp'pĕt* [see SIP]: a small sop.

SIPUNCULOIDEA, n. plu. *sī-pŭng'kū-loy'dē-ă* [L. *sipun'cŭlus, siphun'cŭlus,* a little pipe (see SIPHUNCLE): Gr. *eidos,* resemblance]: class of worms now called Gephyrea. SIPUNCULUS, n. *sī-pŭng'kū-lŭs,* genus of marine animals, known as Spoon-worms, belonging to the group *Gephyrea* and family *Sipunculidæ.* In common with the group (referred to a heterogeneous assemblage named *Vermes*), they have no distinct rings nor processes answering for feet, and the nervous system is imperfect. Some are found in shells of mollusks, and other species in the sand. They are used for bait, and one species is eaten in some countries.

SIQUIJOR, *sē-kē-hôr':* Philippines; (1) pueblo, island of Siguijor, province of Bohol, on the n.w. coast of the island. It has a good harbor, and is the chief port and principal town of the island. Pop. 11,790. (2) Island, the second in importance of the province of Bohol, lying s.w. of the island of Bohol, and e. of Negros; length from e. to w., 17 m.; width, 12 m.; area, 126 sq.m. The surface is much broken, rising to a central peak 1,394 feet high. The soil is fertile; tobacco of excellent quality, rice, corn, hemp, and chocolate are raised and bartered for wax and cotton; a coarse variety of hemp cloth is manufactured for export; tortoise shell and sea cucumbers (bèche de mer) are gathered in large quantities. The island is densely populated. Pop. 41,746.

SIQUIS, n. *sī'kwĭs* [L. if any one]: a notice given in church that a certain person is a candidate for holy orders, to inquire *if any one* can allege an impediment.

SIR, n. *sėr* [F. *sire,* sir or master—contracted from *Seigneur,* from L. *senĭor,* more aged; *senex,* old: It. *sere,* sir, a title of doctors, priests, clerks, etc.]: a word of respect used in addressing any man—*madam* is the corresponding word in addressing women; in *OE.,* a priest; a man.—*Sir* was a term originally corresponding to *dominus* in Latin, and which has come, when appended

to the Christian name and surname, to be the distinctve mark of knighthood. It was anciently the practice to use the same title in addressing the clergy, a familiar instance being Sir Hugh Evans in the *Merry Wives of Windsor*. Used with the Christian name and surname, 'sir,' as pertaining to the nobility, is now applied exclusively to knights and baronets—the wife of a baronet being styled *lady*. Standing alone, Sir is a common complimentary mode of address used without much consideration of rank or social status.—Sire is another form of the same monosyllable.

SIRASKIER and SIRASKIERATE. See SERASKIER.

SIRCAR, n. *sėr-kâr'* [Hind. *sarkar*, a chief, a superintendent—from *sar*, the head; *kar*, work]: in *Hindustan*, a superintendent; a native clerk or writer.

SIRDAR, n. *sėr-dâr'* [Hind. *sardar*, a chief—from *sar*, the head; *dar*, holding]: in *Hindustan*, a native chief or headman; the head of a set of palanquin-bearers.

SIR-DA'RIA. See SYR-DARIA.

SIRE, n. *sīr* [F. *sire*, sir or master, a title without addition given only to the king, but to others with some addition (see also SIR)]: a word of respect, used only in addressing a king; in *poetry*, a father; the male parent of a beast, particularly of a horse; also used in composition, as *grandsire:* V. as applied to a beast, to beget; to affiliate. SIR'ING, imp. SIRED, pp. *sīrd*. SIRE'LESS, a. *-lĕs*, not having a sire.

SIREDON, *sī-rē'dŏn* [Gr. *seirēdōn*, same as *seirēn*, siren]: name of the genus to which belongs the *Axolotl* (q.v.). Naturalists distinguish several species of Siredon —e.g., *S. mexicanus*, the true Mexican axolotl; *S. lichenoides*, found in Utah, Wyoming, and elsewhere; *S. gracilis*, etc. It is now known, through observations and experiments made with siredons (axolotls) at Paris by Duméril (1865), confirmed by similar observations and experiments of Prof. Marsh, Tegetmeier, Boulenger, and Marie von Chauvin, that Siredon is the larval form of the salamandroid genus *Amblystoma*—but a larval form arrested in its development, not passing (under its ordinary life-conditions) into the perfect state, yet attaining full power of reproduction. In Duméril's observation, 6 axolotls (5 males, 1 female), that had been for a year in the Paris Museum of Natural History, began to breed. The period of development within the egg was 23-30 days. After 6 months the young were almost as large as the parents, and then one after another began to undergo metamorphosis, like that of the larva of *Triton*, to the adult form. Yellow spots appeared on the skin, the gills disappeared and the gill-slits closed up, the median fin disappeared, the animals began to breathe air, and quit the water permanently. Out of several hundred larvæ, about 30 were thus transformed: the rest retained the larval form of the parents. The metamorphosed siredons were seen to

possess all the generic characters of *Amblystoma:* they have been definitively identified with the species *A. tigrinum*, found in Mexico and the United States. Prof. August Weissmann (q.v.) infers that the ancestors of the axolotl passed through the normal life-history of *Amblystoma*, the climate of the Mexican table-land having formerly been moist enough to permit the existence of a terrestrial salamandroid; that the climate is now so dry and unfavorable to vegetation that no amphibian can live in it except in water; and that *Amblystoma* has become adapted to these conditions by ceasing to pass through its metamorphosis, and breeding entirely in the branchiate (gilled) condition. Thus the metamorphosis that takes place sometimes in captivity is a case of Atavism (q.v.). The transformed siredons were kept alive for 10 years in the Paris Museum of Natural History, but showed no signs of sexual activity

SIREN, n. *sī'rĕn* [L. *sīrēn;* Gr. *seirēn*, a siren—prob from *seira*, cord or string: It. *sirena:* F. *sirène*]: in *myth.* [Gr., *entanglers*], one of the maidens or birds with the faces of women, who, on the s. coast of Italy, by their sweet voices, enticed ashore those who were sailing by, and then killed them: an enticing or alluring woman (see SIRENS): in *zool.*, a tailed amphibian, like a salamander, found in N. Amer.; the mud-eel (see below): ADJ. pertaining to a siren; bewitching; fascinating. SI'REN, *-rĕn*, or SI'RENE, n. *-rēn*, in *acoustics*, instr. for determining the number of vibrations corresponding to the different pitches of musical sound (see below). SIRENIA, n. plu. *sī-rē'nĭ-ă*, an order of mammalia containing the manatee, or sea-cow, and the dugong, which, from their aquatic habits and the formation of their hinder extremities, have been compared with the *sirens*. SIRE'NIAN, a. *-nĭ-ăn*, relating to the order *Sirenia*.

SI'REN: genus of perennibranchiate batrachia, of eel-like form, but having two small weak limbs on the fore-part of the body. Each foot has four toes. There is no vestige of a hinder pair of feet, nor of a pelvis. The vertebræ are numerous, and each of the vertebræ of the body carries a pair of short ribs. The vertebræ of the tail are

Siren Lacertinus.

compressed, and gradually diminish in size to its tip. The head is flattened, mouth not deeply cleft, muzzle blunt,

eyes are very small, ears concealed. The teeth are small; the lower jaw is furnished with them all round; there are none on the upper jaw, but two rows on each side of the palate. On each side of the neck are three gills, each consisting of a short fleshy stalk, supporting a beautiful fringe-like tuft, and water passes from the mouth to the gills through openings as in fishes. But the S. has also lungs, which are long bags, one on each side, beginning behind the heart and extending almost the whole length of the abdomen. The blood-disks are remarkable for their large size, exceeding even those of the proteus. The sirens inhabit the swamps of the Carolinas and other s. parts of N. America. They live chiefly in the mud, but sometimes are seen swimming in the water, and even make excursions on moist ground. They feed on worms and insects. *S. lacertina* grows to the length of about three ft. Its color is blackish. The tail is compressed. The other species are smaller.

SI'REN: instrument for production of musical sounds in such manner as to facilitate discovery of their ultimate nature, by indicating the number of vibrations.

The simplest form of the acoustical instrument known as 'Siren' is represented in section in fig. 1. A vane consisting of four equal plates, attached to a delicately supported axle, is so fixed in a metal tube as to close it almost completely (with the help of stops P, P), when either pair of plates is perpendicular to the axis of the tube. When air is forced from a bellows through the pipe A, it gives the vane a rotation in the direction indicated by the arrow, and thus produces a current which is interrupted four times in each revolution. In other words, four times in each revolution the air escapes freely, giving rise to a sound. While the vane revolves slowly, the ear distinguishes these successive puffs; but when the revolutions are more numerous than about five per second, the successive puffs cannot be distinguished, and the recurrent sounds are merged into a uniform note, whose pitch rises (i.e., it becomes more and more shrill) the faster the vane revolves. Such an instrument works well when driven by water instead of air. What it shows is, that musical sounds consist of the repetition, at equal very small intervals of time, of some definite noise. By turning the vane by means of a train of wheels, so as to give it a definite rate of rotation, the number of such repetitions per second, necessary for production of a given musical note, may be measured.

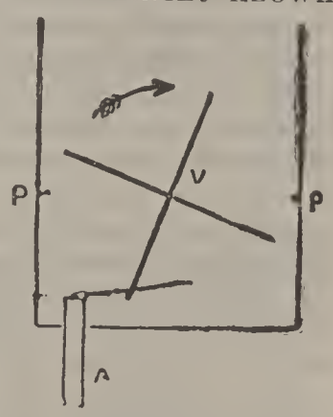


Fig. 1.

But the siren of Cagniard de la Tour is much more valuable for such a purpose, as it counts for itself the number of repetitions per second. In principle, it is identical with the simpler instrument above described; but the details of construction are different. It consists essentially of two circular disks, the upper of which is free to revolve

so as almost to touch the lower (fig. 2). In each a series of holes is cut, arranged at equal distances in a circle about its axis. Through the holes in the lower (fixed) plate, streams of air are admitted from a bellows, and pass through

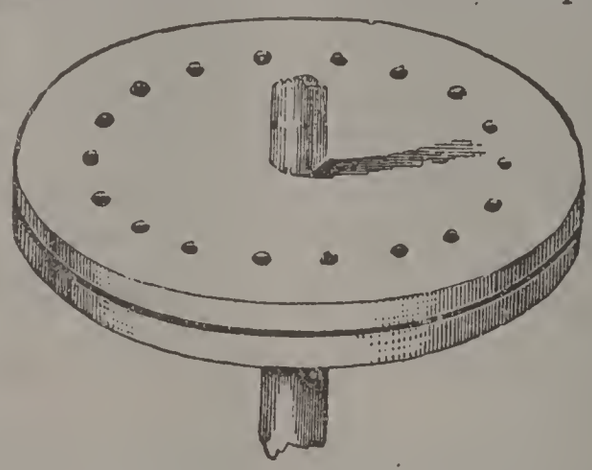


Fig. 2.

the corresponding hole in the upper (movable) plate, when the pairs of holes are superposed; but are checked when the upper plate is turned a little, readmitted when the plate turns a little further, and so on. The holes are pierced *obliquely* through the upper plate, so that the issuing stream makes it turn about its axis. The sounds given by this instrument are exceedingly pure (see SOUND), like those of the flute or tuning-fork. The axis of the upper plate carries an endless screw, which turns a light train of wheels (with dials) resembling that of a gas meter, so that when, by proper adjustment of the pressure in the bellows, the instrument gives steadily some definite note, we may observe the number of turns in any number of minutes by watch. The number of puffs is obviously to be found from this by multiplying by the number of holes in the plate, since during one turn any hole in the upper plate has been opposite each of those in the lower plate in succession: thus we find the number of puffs per second necessary to the formation of any given musical note. More complex forms, such as Helmholtz's double S., have been devised for more recondite purposes. See SOUND. —A S., the fog-siren, is now much used for giving Fog Signals (q.v.).

SI'RENS: in Greek mythology, young maidens, or birds with faces of women, who sat on the shores of a certain island or promontory near the s.w. coast of Italy, and sang with bewitching sweetness songs that allured the passing sailor to draw near, but only to meet with death. Homer speaks of them in the plural, but does not specify their number, later writers mention two or three by name, and assign them various genealogies. Their tenure of life was dependent on the successful exercise of their charms. If any seaman could resist the enticements of their magic music, they were doomed; but Ulysses or the Argonauts alone succeeded in doing so. It is related by Homer, in the *Odyssey*, that when Ulysses in his wanderings approached their perilous home, he, by advice of the sorceress

Circe, stuffed the ears of his companions with wax, and lashed himself to a mast, until he had sailed out of hearing of the fatal songs. Others say that it was the Argonauts who passed safely, owing to the superior enchantment of Orpheus's singing, whereupon the Sirens threw themselves into the sea, and were transformed into rocks. The Latin poets give them wings, and in works

Siren.

of art they are often represented as birds with the faces of virgins, and are provided with musical instruments. There is obviously a close resemblance between the Mermaid (q.v.) of n. mythology, and these Græco-Mediterranean Sirens. The Loreley of the Rhine is only a river-siren, though a more exquisite enchantress than ever Greek fancy conceived.

SIRIASIS, n. *sĭ-rī'ă-sĭs* [Gr. *seiriasis*, sunstroke—from *seirĭŏs*, hot, scorching]: in *med.*, a disease of childhood, consisting of inflammation of the brain or its membranes, caused by the excessive heat of the sun.

SIRINAGUR': see SERINAGUR.

SIRI PUL, *sē'rē pŏl:* town of Afghan Turkestan, 45 m. s.w. from Balkh; lat. 36° 21′ n., long. 66° 28′ e.; on a river which loses itself without reaching the Jihoon. It is cap. of an Uzbek chief. Pop. 18,000.

SIRIUS, n. *sĭr'ĭ-ŭs* [L. *sirĭus*, the dog-star—from Gr. *seirĭŏs*, hot, scorching: It. *sirio*], otherwise called *Canicula*, or the *Dog-star:* star of the first magnitude, the brightest in the heavens; in the constellation of *Canis Maior*, or the 'Great Dog.' It is about 125,716,000,000,000 miles (or 1,375,000 times the radius of the earth's orbit) distant from the earth: a ray of light (see LIGHT) from S. reaches the earth in about 21 years: see STARS. It has long been known to possess a 'proper motion' (i.e., an independent progressive motion), which was for a time believed to be in a straight line, but has now been shown to consist of an undulatory progressive motion on each side of a middle line. This motion was investigated by Prof. Peters of the Pulkowa Observatory, Russia, on the supposition that its anomalous character was produced by the attraction of some unseen neighbor, and his calculations being completed and verified (on this supposition) by Safford of

Washington, the distance of S. from the centre of gravity of both was determined to be 1,495 millions of miles. 1862, Jan., Alvan G. Clark of Cambridgeport, Mass., chancing to observe S. through a powerful telescope, detected a minute star (never before observed) at an angular distance of 7″ from S., representing about 4,300 millions of miles, and it is generally believed that this is the disturber in question. By photometric measurement it has been shown that, supposing the intensity of the sun's light for unit of surface to equal that of S., it would require 400 suns at the distance of S. to send us the light which that star does; and our sun at the distance of S. would appear less than a star of the sixth magnitude, and be invisible to the naked eye. S. appears to be one of the stars that change color: to the ancients it appeared as a red star; at present it is noticeable for brilliant whiteness. The Egyptians called this star Sothis, and at one time its 'Heliacal Rising' (q.v.) was a sure forerunner of the rising of the Nile; while among the Romans it was considered as a star of evil omen, whose appearance above the horizon coincided with (or even caused) the unhealthful and oppressive heats of summer. Hence the origin of the various superstitions regarding the Dog Days (q.v.), many of which are still current, e.g., that dogs are then liable to madness.—The term 'dog star' was applied also to Procyon, a bright star in *Canis Minor*, whose heliacal rising differs by only a few days from that of Sirius.

SIRKAR, n. *sĕr'kĕr:* a Hindu clerk or accountant; a circar; the government.

SIRLOIN, n. *sĕr'loyn* [F. *surlonge*, a sirloin of beef—from *sur*, over; *longe*, a loin—a popular etymology is given in the story that the *loin* was sportively knighted by Charles II.]: a loin of beef.

SIRNAME: see SURNAME.

SIROCCO, n. *sĭ-rŏk'kō* [It. *sirocco;* Sp. *siroco*, the sirocco—from Ar. *sharq*, the east]: the hot parching wind which passes over the s. of Italy, Malta, and Sicily in the latter part of summer and autumn; supposed to originate in the Sahara or Great Desert of Africa. See SIMOOM: HARMATTAN

SIRRAH, n. *sĭr'rä* [a supposed but scarcely probable compound of *sir*, *ha*, or *ho:* Icel. *sira*, sirrah, a term of contempt]: a word used in anger, contempt, or reproach, sometimes in familiarity, in addressing.

SIRUP, n., more usually spelled SYRUP, n. *sĭr'ŭp* [F. *sirop*, sweet juice—from Sp. *xarope*, a medicinal drink—from Ar. *sharab*, a beverage, syrup]: the juice of vegetables or fruit sweetened with sugar. SIR'UPED, a. *-ŭpt*, moistened with sirup or sweet juice. SIR'UPY, a. *-ŭp-ĭ*, like sirup, or partaking of its qualities.—See SYRUP.

SIRVENTE, n. *sĕr-vängt'* [F. *sirvente*—from L. *servīrĕ*, to serve]: *literally*, a poem of service; in the *middle ages* a particular kind of poetry in common use among the troubadours

SISAL HEMP, *sĭs'al hĕmp* (*Agave*): fibre-plant, of which there are many varieties. This name is applied to the fibre also. The fibre, known as Mexican grass, henequen, and by various other names, has been in common use since the time of the Aztecs, by whom it was employed. It is now being largely produced in and exported from Yucatan and Mexico, is coming into prominence in Cuba and the Bahamas, and is being grown experimentally in Florida. Plants were brought from Yucatan to Fla. 1836 and at later dates. Several patches now growing wild can be traced to plants set out at least 40 years ago.

The plant cannot be profitably grown above the frost-line. Though it can be produced in rather poor land, it gives much better returns in fertile soils. The land should be well plowed, and the plants set in rows about 12 ft apart one way and 6 ft. the other. About 600 plants per acre will be required. Much closer setting is often practiced, but is not to be commended. Plants should be about 18 in. high when set, and should be put out during the rainy season. Weeds must be kept down by cultivation, and suckers should be promptly removed. The latter can be kept in the nursery till they are large enough to set in the field. A much more prolific source of supply is the flower-stalk or 'pole' of the mature plant, which grows 15 to 20 ft. high, and from which buds, which form plants, start after the flowers have fallen. Leaves for fibre should be not less than 3 ft. long. Such leaves can be obtained from plants in 3 to 5 years after they are set, and the size increases considerably with the age of the plant. A plantation remains productive 10 to 30 years, according to the cultivation and the climate. A fully grown plant should yield about 40 leaves, and from an acre of good land 1,000 to 1,500 lbs. of clean fibre should be obtained. Considerable machinery is needed to prepare the fibre for use. As it is injured less by dampness, the fibre makes better ropes than the true hemp. It is also largely used in manufacture of hammocks.

SISCO, *sĭs'kō*, properly CIS'CO (*Corregonus Hoyi*): one of the smaller Whitefishes, the genus giving name to a subfamily of *Salmonidæ*. It is called also Moon-eye, and is thus far found (at great depth) only in Lakes Michigan, Erie, and Ontario. It is small (seldom over ½ lb.) and rare and is of little value.—The name is applied also in Ind. and Wis. to the Lake or Michigan Herring (*C. Artedi*), a valuable food-fish abundant in shallow waters of the Great Lakes and adjacent small lakes of the northwest.

SISCOWET, *sĭs'kō-wĕt*, or SISKAWITS, *sĭs'kaw-ĭts* (*Salvelinus namaycush*, var. *Siscowet*): variety or sub-species of the Lake Trout, found only in Lake Superior, and rare there as compared with the ordinary species. The Indian name is an Ojibewa word, meaning 'cooks itself,' the fish being so fat that it can be set on fire and made to cook itself. In the frying-pan it never requires pork-fat, like the drier common lake trout; in fact, it is too oily when fresh: but when salted and broiled, after long steeping in water, it is so delicious that it is consumed mostly in mar-

kets near its haunts. It was described first by Agassiz in *Lake Superior* (1850). To those familiar with it, it has enough peculiarities of shape and markings to be readily distinguished from the Namaycush. Unlike the latter, it is said to spawn at all seasons. The average weight is 4½ lbs., the maximum about 30 lbs., half that of its congener.

SISKIN, n. *sĭs'kĭn* [Dan. *sisgen;* Norw. *sisk;* Sw. *siska*, a siskin: Dut. *sissen*, to twitter like small birds]: small singing-bird, of yellowish hue; a favorite cage-bird, allied to the Goldfinch, also to the Redpoll; also to the Yellow-bird of North America. These birds are usually seen in small flocks, haunting the margins of streams, and are much sought after by bird catchers, and when interbred with the canary produce a hybrid progeny with a sweet mellow song. A very similar Canadian bird is known as the pinesiskin; and the name is sometimes given to the goldfinch.

SISLEY, *sĭs-lĭ*, ALFRED: French painter: b. Paris, 1830; d. 1899. He was little known except as a promising pupil of Gleyre, until the Impressionists held their exhibition in 1874, when his boldness and originality were acknowledged. His indebtedness to Corot and even more so to Monet is apparent in all the landscapes which he produced, characterized as these are by poetic charm and remarkable freshness and frankness in color and detail. Among his works may be mentioned: *La Seine à Saint Mammés;* and *L'Inondation, Marly* (1876).

SISMOGRAPH, n. *sĭs'mō-grăf*. See under SEISMOGRAPHY.

SISMOMETER. See SEISMOMETER (under SEISMOGRAPHY.

SISMONDI, *sĭs-mŏn'dĭ*, F. *sēs-mōng-dē'*, JEAN CHARLES LEONARD DE: historian: 1773, May 9—1842, June 25; b. Geneva; of Italian descent. He studied at the 'College' or high school of Geneva; and then entered the university. His father's pecuniary reverses made it necessary for Sismondi to quit the university and become a banker's clerk, at Lyon. But the overthrow of the constitution of his native town obliged him to flee with his father to England. On his return, two years after, he was imprisoned, and lost the greater part of his property by confiscation. In 1795 they bought a small farm near Pescia, in Tuscany, where the smallness of their means rendered it necessary for Sismondi almost literally to put his hand to plow. Similar persecution followed him even in Tuscany, where he was hated by the French as an aristocrat, and by the Italians as a Frenchman; but at length, on his return to Geneva in 1800, he was allowed to live in quietness and devote himself with the utmost diligence to literary pursuits without declining to bear his part in the discharge of municipal functions. In 1803 appeared a work on political economy, *De la Richesse Commerciale*,

in which he writes like a decided follower of Adam Smith, though at a later period, in his *Nouveaux Principes d'Économie Politique* (1819), he abandoned the views of his youth. He had become intimate with Madame de Staël, and in 1805 accompanied her on a tour through Italy. The associations thus awakened appear to have called his attention particularly to history. The first fruits of his labors in this department appeared in 1807, in the first two volumes of his *Républiques Italiennes,* which ultimately reached 16 volumes, and was not completed till 1818. This work gave him a good rank among contemporary historians; it is now considered the best, though not the most extensive, of his works. In 1813 appeared his *Littérature du Midi de l'Europe* ('Literature of the South of Europe,' Eng. by Roscoe, frequently reprinted). In 1819 he began his greatest work, *Histoire des Français,* with which he was occupied until his death—publishing 29 volumes in 23 years. In the same year he married Miss Allen, an English lady, whom he had previously met in Italy: the marriage was a happy one. Thereafter he resided mostly in Geneva.—Sismondi contributed more to historical literature than any other writer of his time, and the labor which he bestowed on his works can seldom have been surpassed. 'Nine times,' he says, 'have I traversed Italy, and I have visited every place which has been the scene of any great historical event.' For 20 years he worked habitually eight hours a day. Both as worker and thinker, he was thoroughly conscientious. He was deficient in intellectual acuteness and in breadth of grasp, and showed himself capable at times of being influenced by prejudice: his style, moreover, is not notable for vigor or precision; but he shows solid judgment, unflagging industry, and unwavering sincerity.

SISSOO, or SISSUM. See DALBERGIA.

SIST, v. *sĭst* [L. *sistĕrĕ,* to cause to stand, to stop]: in *Scot. civil* and *eccles. law,* to stop; not to go further in the meantime; to cite or summon. SIST'ING, imp. SIST'ED, pp. To SIST PROCEDURE, to delay judicial proceedings in a cause. To SIST ONE'S SELF, to take a place at the bar of a court where one's cause is to be tried.

SISTAN', LAKE OF. See SEISTAN.

SISTER, n. *sĭs'tĕr* [Goth. *swistar;* Pol. *siostra;* Dan. *söster;* Dut. *zuster;* Sw. *syster,* a sister: comp. Skr. *svasar,* she who pleases or consoles; *svasti,* joy, happiness: L. *soror,* sister]: a female born of the same parents as another person—the male is called a *brother;* a woman of the same faith or society: V. in *OE.,* to be sister; to resemble greatly. SIS'TERLY, a. *-lĭ,* like a sister; affectionate. SIS'TERLESS, a. *-lĕs,* having no sister. SISTERING, a. in *OE.,* allied; contiguous. SISTER-IN-LAW, n. a husband's or a wife's sister; a brother's wife. SIS'TERHOOD, n. *-hŭd,* a society of females united in one faith or order. STEP or HALF SISTER, a sister by one parent only.

SISTERHOODS: religious associations of women. There are some grounds for believing that religious communities of women were found in the Christian Chh. earlier than communities of men; see I Tim. v. 9–12: Acts x. 39; see also the shorter version of the alleged letter of Ignatius to the faithful at Smyrna, in which mention is made of 'virgins who are called widows.' It is certain that when St. Anthony was about to embrace the anchoretic mode of life (about A.D. 300) he placed his sister in a 'Parthenōn,' or convent of virgins. The writings of Tertullian (b. 160) and Cyprian (b. 200) are full of exhortations addressed to women vowed to perpetual virginity, and in their time monastic orders of women must have been numerous. Pachomius, the first lawgiver of the cenobites, induced his sister to establish a community of virgins vowed to observe the same rule of life which governed the communities (cœnobia) of men founded by him on the island of Tabennæ in the Nile. That rule distributed the inmates into cells, each containing three cenobites: here they lived remote from the world, practicing austerities of every kind, living on the scantiest fare, tilling the ungrateful soil of the Egyptian deserts to supply their simple wants: these cœnobia of virgins were founded in the first half of the 4th c. From the land of the Nile the rule of St. Pachomius was carried into Syria and Palestine, Armenia, Asia Minor, and Italy; and thence it spread over the whole West. In Egypt alone, in the 5th c., of 100,000 cenobites living under the Pachomian rule, one-fourth were women. In the East the rule given by St. Basil (d. 379) superseded the rule of St. Pachomius, and the Basilian rule persists to this day without essential modifications. In the West the rule of St. Benedict (d. 543) supplanted that of Pachomius; but before Benedict's day, Jerome (d. 420) and Augustine (d. 430) had founded convents of nuns with monastic codes differing from that of Pachomius. Benedict's sister Scholastica brought together a number of women under the Benedictine rule, and to this day her spiritual progeny exist in the Roman Chh. Many of the reformers of the great Benedictine order—Benedict of Aniane, Berno of Cluny, Robert of Molesme (founder of the Cistercians), and others—established convents of women governed by substantially the same rules that they formulated for convents of monks. In like manner the founders of the Austin Canons, the Premonstratensians, and even of the military orders—Templars, Hospitalers, Knights of St. John of Jerusalem, etc.—instituted communities of women affiliated to those orders; the rule of the women's convents attached to the military orders obligated the sisters to serve in lazar-houses, hospitals, etc.: this was the first step toward the institution of congregations of religious women expressly for performing works of mercy and charity, and not simply for practice of asceticism and for the exercises of the contemplative life. The 13th c. saw the rise of the orders of 'friars'—the mendicant orders, Franciscans and Dominicans, with convents for both sexes. The congregation of the Sisters

of Charity, or Daughters of Charity, founded 1634 by St. Vincent de Paul, is the model after which have been fashioned most of the congregations of women established since. The spirit of St. Vincent's rule is seen in the memorable words that he addressed to his spiritual daughters: 'Your convent must be the house of the sick; your cell, the chamber of suffering; your chapel, the parish church; your cloister, the streets of the city, or the walls of the hospital; your rule, the general vow of obedience; your grille, the fear of God; your veil to shut out the world, holy modesty.' Many other orders or congregations of women have been instituted in the Roman Chh. since the time of Vincent de Paul, nearly all of them for the performance of works of mercy and charity. There are several congregations known as Sisters of Charity that are not under the rule of St. Vincent de Paul.—In the United States the congregation of Sisters of Charity founded by Mrs. Seton (q.v.) was originally an independent organization; but about 1860 the mother-house at Emmittsburg, Md., was aggregated to the central organization in France, and adopted the rule and habit of the Filles de la Charité. But in several dioceses the sisters there 'on mission' elected to retain their original rule and habit, and to remain subject only to the diocesan ecclesiastical authorities. The following table shows the names and date of institution of at least all the most notable sisterhoods that have existed either in the e. or the w. chh., including the Protestant sisterhoods:

RELIGIOUS SISTERHOODS.

[Many of the dates, particularly the earliest, are approximative only. The names of founders are given in parenthesis.]

Date.
350 Tabennites (Pachomius).
365 Basilian nuns (St. Basil).
530 Benedictines (St. Benedict).
641 Nuns of Nivelles, Flanders.
910 Benedictines of Cluny (Berno).
1060 Augustinians.
1098 Cistercians (St. Robert of Molesme).
1120 Premonstratensians (St. Norbert).
1173 Beguines (Lambert le Bègue).
1200 Penitents of St. Mary Magdalene.
1209 Carmelites (Berthold).
1212 Nuns of St. Clare (St. Francis and St. Clara).
1215 Dominicans (St. Dominic).
1263 Brigittines (St. Briget of Sweden).
1390 Hieronymites (Maria Garcias)
1433 Oblates (St. Frances of Rome).
1443 Daughters of St. Martha, Hospitallers.
1453 Madelonettes.
1493 Filles Repenties (Jean Tisserand)
1503 Annonciades (Jeanne of Valois).
1525 Capuchines.
1537 Ursulines (Angela de' Merici).

SISTERHOODS.

1568 Discalced Carmelites (St. Theresa).
1596 Notre Dame de St. Paul.
1608 Jacobines, or Reformed Dominicans.
1610 Nuns of the Visitation (Jeanne Frances de Chantal).
1611 French Ursulines.
1617 Hospitallers of St. Charles.
1618 Nuns of Calvary.
1624 Hospitallers of the Charity of Our Lady.
1624 Nuns of Our Lady of Refuge.
1625 Religieuses de la Croix.
1629 Sisters of Charity (St. Vincent de Paul).
1633 Order of Mercy.
1639 Sisters of the Blessed Sacrament.
1641 Nuns of the Good Shepherd (Madeleine l'Amy).
1643 Daughters of Providence.
1650 Sisters of St. Joseph.
1653 Benedictines of Perpetual Adoration.
1660 Hospitaller Nuns of St. Thomas of Villanova.
1678 Sisters of the Child Jesus.
1679 Daughters of Providence.
1684 Sisters of the Presentation.
1686 Ladies of St. Cyr (Mme. de Maintenon).
1686 Daughters of the Good Shepherd.
1704 Sisters of Charity of St. Paul the Apostle.
1712 Congregation of the Good Saviour.
1713 Religious of the Blessed Sacrament.
1732 Redemptorists (St. Alfonzo de' Liguori).
1800 Ladies of the Sacred Heart.
1801 Dames de St. André.
1816 Sisters of Jesus and Mary.
1820 Sisters of Notre Dame.
1820 Sœurs de l'Espérance.
1822 Faithful Companions of Jesus.
1824 Sœurs de Bon Secours.
1824 Marist Sisters.
1827 Sisters of Mercy (Catherine McAuley).
1833 School Sisters of Notre Dame.
1833 Daughters of the Cross.
1836 Deaconesses * (Theodor Fliedner).
1840 Deaconesses.†
1840 Little Sisters of the Poor.
1842 Deaconesses * (Pastor Harter).
1842 Deaconesses of St. Loup.‡
1843 Sisters of Notre Dame de Sion.
1846 Society of the Holy Child Jesus.
1847 Society of the Holy Trinity.§
1848 Sisters of the Poor Child Jesus.
1849 Poor Handmaids of Jesus Christ.
1849 Sisters of St. Mary the Virgin.§
1850 Sisters of the Most Holy Cross and Passion
1851 Sisters of Nazareth (Cardinal Wiseman).
1851 Sisterhood of All Saints.§
1852 Deaconesses of Richen.‡
1854 Society of St. John the Baptist.§

* *Lutheran.* † *French Reformed*
‡ *Swiss Reformed.* § *Ch. of England.*

1855 Nursing Sisters of St. Margaret.§
1856 Helpers of the Holy Souls.
1861 Deaconesses.§
1861 Sisterhood of St. Peter.§
1861 Congregation of the Finding of Jesus in the Temple.
1864 Little Sisters of the Assumption.
1865 Sisterhood of St. Mary.§
1866 Sisters of Bethany.§
1869 Sisterhood of the Good Shepherd.§
1870 Sisters of the Church.§
1870 Little Company of Mary.

In the United States there were (1891) in the Prot. Episc. Chh. the following sisterhoods: Sisterhood of St. Mary, with houses (schools) in New York, Peekskill, N. Y., Memphis, Tenn., besides hospitals and retreats in sundry places. Sisterhood of the Holy Communion, conducting a training school, home for aged women, babies' shelter, and shelter for girls: all in New York. Sisterhood of the Good Shepherd, conducting training schools, etc., in several parishes in New York and St. Louis, in N. J., Tenn., and elsewhere. Sisterhood of St. John Baptist, with a number of houses in New York, and one in South Amboy, N. J. Sisterhood of the Holy Child Jesus, at Albany, N. Y.; of St. Margaret, Boston and other cities; of St. John Evangelist, Brooklyn; of Sts. Philip and James, New Orleans; of St. Martha, Louisville, Ky.; of the Holy Nativity, Providence, R. I.; of the Holy Name, Texas; All Saints Sisters of the Poor, Baltimore; Sisters of St. Mary and All Saints, Baltimore; Order of Deaconesses of the Diocese of Ala.; Grace Training School for Deaconesses, New York. There are sisterhoods in every Rom. Cath. diocese and vicariate apostolic of the United States. —For some of the prominent sisterhoods in the foregoing list, see their respective titles.

SISTINE, a. *sĭs'tĭn;* of or pertaining to Pope Sixtus V., as the Sistine Chapel in the Vatican at Rome.

SISTOVA, *sĭs-tō'vâ:* important commercial town of the principality of Bulgaria, on the s. bank of the Danube, about 35 m. above Rustchuk. It has several mosques, an ancient and strong castle, where the 'peace of Sistova' between Austria and Turkey was concluded 1791; manufactures cottons and leather, and has active river-trade. More than half the people are Bulgarians; the rest Turks, Walachians, and Gypsies. Pop. 15,000.

SISTRUM, n. *sĭs'trŭm* [L. *sistrum;* Gr. *seistron*, a sistrum, a metallic kind of rattle—from Gr. *seiein*, to shake: It. *sistro:* F. *sistre*]: a musical instr. used by the anc. Egyptians in the worship of Isis, consisting of a thin oval metal frame, through which passed loosely a number of metal rods, and furnished with a handle.

SISUPĀLA, *sĭs-ô-pâ'la:* in Hindu legend, sovereign of Chedi, a country in central India; the enemy of Krishna (q.v.), and ultimately slain by him. The history of this

§ Church of England.

enmity, and the death of S., are the subject of the *S'is'u-pâlabadha* of Mâgha: see SANSKRIT LITERATURE.

SISYPHUS, n. *sĭs'ĭ-fŭs* [L. *Sis'yphus;* Gr *Sis'uphos*, Sisyphus]: in *anc. myth.*, son of Æolus, founder and king of Corinth, famous—with his whole house—for cunning and robberies: he was killed by Theseus, and condemned by Pluto in the infernal regions to roll an immense rock from the bottom of a hill to its summit. The rock, whenever it neared the top, rolled down again, thus making his task endless. He was said to have murdered travellers with a huge block of stone. SIS'YPHE'AN, a. *-fē'ăn*, or SISYPHIAN, a. *sĭs-ĭf'ĭ-ăn* [L. *sisyph'ĭus*, of or belonging to Sisyphus]: relating to Sisyphus; incessantly recurring; fruitless, as labor.

SIT, v. *sĭt* [AS. *sittan*, to sit: Ger. *sitzen;* Dan. *sidde*, Icel. *sitia*, to sit: L. *sidĕrĕ*, to seat one's self]: to rest on the lower part of the trunk of the body; to be in a state of rest or idleness; to settle or abide; to be in any situation or condition; to cause to be seated; to incubate; to brood; to be adjusted or fit; to be convened, as an assembly; to hold a session; to exercise authority; to be in any local or official position; to represent in parliament, as he *sat* for Edinburgh; to rest on or bear, as applied to grief, weight. SIT'TING, imp.: N. the act of taking, or posture of being on, a seat; a seat or place, as in a church; the actual meeting of any body of men; the time for which one sits, as to a portrait-painter, at play, etc.; the time or course of uninterrupted study or sedentary labor, as, at one *sitting;* session, as of a court of law or parliament; incubation. SAT, or SATE, pt. *săt*. SAT, pt. pp. *săt*, sometimes SITTEN, pp. *sĭt'n*. SIT'TER, n. *-tĕr*, one who sits; a bird that broods. To SIT DOWN, to place one's self on a chair or seat; to settle; to fix one's abode; to be seated: to begin a siege. To SIT FOR A PORTRAIT, to assume, for a limited time, a proper position to allow one's portrait to be painted by an artist. To SIT OUT, to remain till all is done. To SIT UP, to rise from a recumbent position; not to go to bed.

SÎTÂ, *sē'tâ:* in Hindu mythology, daughter of Janaka, King of Mithilâ, and wife of Râma: see VISHN'U. Sîtâ means 'furrow,' as she was not born, but arose from a furrow when her father was plowing the ground, whence she is called also *Pârthivî* [from *pr'thivî*, the earth]. She is the heroine of the RÂMÂYAN'A (q.v.).

SITE, n. *sīt* [F. *site*—from L. *situs*, position: It. *sito*] the place where anything is fixed; local position; situation; spot; ground-plot. SITED, a. *sīt'ĕd*, in *OE.*, placed; situated.

SITFAST, n. *sĭt'făst* [*sit*, and *fast*]: an ulcerated horny sore growing on a horse's back under the saddle: ADJ. immovable; stationary.

SITH, conj. *sĭth:* OE. for SINCE; seeing that.

SITHE, n. *sīth* [AS. *sith*, time]: in *OE.*, time.

SITHE, n. *sīth* [see SCYTHE], in *OE.*, a scythe: V. to cut down with a scythe. SITHED, a. *sīthd*, armed with scythes.

SITIOLOGY, n. *sĭt'ĭ-ŏl'ŏ-jĭ*, or SITOLOGY, n. *sī-tŏl'ŏ-jĭ* [Gr. *sition, sitos,* food; *logos,* a discourse]: in *phys.*, the doctrine or consideration of aliments; dietetics.

SITKA, *sĭt'ka,* or NOVOARKHANGELSK, *nō-värk'ăng-ghĕlsk'* (New Archangel): village, cap. of Alaska Terr.; on the w. coast of Baranoff or Sitka Island, and on the Pacific Ocean; lat. 57° 3′ n., long. 135° 18′ w. It has a small but safe and beautiful harbor, protected from the sea by Mount Edgecombe, nearly surrounded by lofty mountains, and studded with numerous small islands. For many years it was the headquarters of the Russo-American Fur Co. and was known as *New Archangel.* Since the cession of the terr. by Russia to the United States (1867), capitalists, chiefly of Cal. and Or., have done much toward developing the four distinct resources of the terr., furs, fish, minerals, and timber. The village contains the remains of the palace of former Russian governors, stoutly built and richly decorated; the old Russo-Greek church, built in the form of a Greek cross, surmounted by a copper-covered dome and chime-bell tower, with interior decorations and altar-furnishings in solid gold and silver, and gold embroidery, and a copy of the *Madonna and Child* from Moscow, in which all parts excepting the faces are executed in gold and silver metal; an old castle, on the rocks overlooking the harbor, built of logs riveted with copper; U. S. custom-house; U. S. milit. station; Presb. mission chapel, school, and hospital; several commercial buildings; and one weekly newspaper. The water-supply is from Indian river. The scenery in the village and its environments is rendered curiously attractive by the many native domiciles with grotesque totem-poles in front. Contrary to the popular impression, the temperature of S., by reason of its location on the sea near the warm current from the s. Pacific, is comparatively mild. During 1881–88 the summer extremes of the thermometer were 79° and 70°; winter 15° and 3°; mean winter temperature 31·1°—36·8°; mean through year 43° 45′. During the year ending 1903, June 30, the imports of merchandise into the terr. were $477,463, and the dom. exports $1,612,128. Pop. of S. (1890) 2,078, of whom 1,188 were whites; (1890) 1,396; (1910 est.) 1,300.

SITOPHOBIA, *sī-tō-fō'bĭ-a,* or SITIOPHOBIA, *sĭt-ĭ-ō-fō'-bĭ-a:* repugnance to or refusal of food, ranging from mere impairment or loss of appetite, or hysterical antipathy to particular viands, to total and prolonged abstinence, as a symptom of delusion or delirium. In the insane, food has been consistently refused for years. During this time, the system was, of course (see FASTING), sustained by compulsory alimentation. The causes are usually local disease in the organs of digestion, associating suffering with the process of nourishment; also, sometimes fear of, or desire for death. According to the mental state predominating, suicide may be courted; or poisoning, drugging, or pollution of aliment may be dreaded; the throat or bowels may be imagined hermetically sealed; God or Satan may have imposed abstinence; the body is dead, inanimate, or belongs

to another. These absurd delusions prove inexpugnable to persuasion, or to the pangs of hunger, and require special treatment. The determination may be exorcised by medicine; it may be overcome by commands, threats, bribes; it may be evaded by giving eggs, cocoa-nuts, milk from the cow, and other substances, into which the dreaded poisons or pollutions cannot be introduced; or it may be defeated by placing food in the stomach by means of the stomach-pump. There have been epidemics of maniacal abstinence.—Chipley, *American Journal of Insanity*, 1859, July; Browne, *Report Crichton Institution*, 1854.

SIT'TA. See NUT-HATCH.

SITTING BULL: Sioux Indian chief: b. Dakota, about 1837; d. 1890, Dec. 15. He was the son of Jumping Bull and the nephew of Four Horns and Hunting-His-Lodge, all Sioux chiefs. He was first named The Sacred Stand; but at 14, having slain and scalped his first enemy, his name was changed to Sitting Bull (in Indian, *Tatanka Yotanka*). As a young man, he showed enmity toward the whites and was repudiated by the more peaceable members of the tribe. During the civil war he led in massacres of whites in Iowa and Minnesota, and in 1864 was driven by United States troops into the Big Horn country and to the Yellowstone. In 1866 he made a pretense of treating with the government, but the next year was again on the war path, and until 1876 was almost continually engaged in warfare with whites or friendly Indians. That year his band exterminated the force commanded by Gen. Custer sent against them on the Little Big Horn. After the massacre he escaped with his followers into Canada, and there remained until 1879, when to end a precarious existence he accepted the amnesty promised by Gen. Miles and returned to United States territory. Though submissive he was never friendly toward the government, and in 1888 influenced the Indians not to sell their lands. During the Messiah craze of 1890 his influence was considered dangerous, and his arrest was ordered. In the attempt to carry out this order he was killed, together with his son, several chiefs, and members of the Indian police.

SITUATED, a. *sĭt'ū-ā-tĕd*, or SIT'UATE, a. *-āt* [mid. L. *situātus*, located—from L. *situs*, situation, local position: It. *situato*, situated]: permanently fixed; placed with respect to any other object; being in any state or condition with respect to others. SIT'UA'TION, n. *-ā'shŭn* [F.—L.]: position; location in respect to something else; state or condition; temporary state; circumstances; place or office, as, in a *situation*.—SYN. of 'situation': site; station; post; condition; state; position; predicament; plight; ease; seat; place; office; circumstance; posture; attitude; locality.

SITUS, n. *sī'tŭs* [L. *situs*, situation]: in *bot.*, the peculiar mode in which parts are disposed, as well as the position they occupy.

SITZ-BATH, n. *sĭts-bâth* [Ger. *sitz-bad*—from *sitz*, a seat; *bad*, a bath]: a sort of tub for bathing in a sitting posture; hip-bath.

SIUT, *sē-oot'*, or ASSIUT, *ä-sē-oot'* (ancient, LYCOPOLIS), Upper Egypt: (1) The capital of a province of the same name, situated in a fertile district near the left bank of the Nile, 247 m. by rail n.w. of Cairo. The town is about three-quarters of a mile w. of the river, where a modern barrage and lock in connection with the great Nile irrigation scheme was completed in 1902. The main street, running e. and w., is about 3 m. in length. Among the chief buildings are the railway station, the government buildings, a good hospital, public baths, an American Presbyterian mission station, with schools, mosques, bazaars, etc. Near the town are some ancient rock tombs. Siut has a trade in excellent pottery, linen, leather goods, carved ivory, natron, soda, and corn. Plotinus, the great Neo-Platonic philosopher, was born here in 205 A.D. Pop. (1897) 42,076. (2) The province has an area of 840 sq.m.; pop. 782,720, giving 932 to the square mile; 30,048 of the population were nomads and 439 foreigners.

SIVA: the third deity in the great triad of Hindu gods. His name signifies in Sanskrit 'happy,' 'of good omen,' and he typifies both destruction and reproduction. His worshippers are called Saivas, and they assign to him the first place in the Trimûrti or triad, attributing to him also many attributes which properly belong to the other deities. According to the Saivas Siva is Time, Justice, Water, the Sun, the Destroyer, and the Creator. He is represented in his characters of the god of regeneration and of justice, as riding on a white bull. He has five heads; three eyes—one on his forehead, indicative of his power of contemplation; two, four, eight, or ten hands; and in the middle of his forehead a crescent. His throat is dark blue; his hair of a light reddish color, thickly matted together, and brought over his head so as to project like a horn from his forehead. He wears a garland of human skulls around his neck, and as a second necklace a serpent; and in his hands holds a trident, surmounted by a skull, and one or two human heads. He is often represented as entirely covered with serpents, which are the emblems of immortality. His weapons are the *Khinkhira*, of which nothing is known, a bow called *Ajakava*, a thunderbolt, and an axe. He resides on the wonderful Mount Kailâsa, the northern peak of the Himalaya. One of his principal attendants is Tandu, a teacher of the arts of dancing and mimicry, whence Siva is the patron of dancers. Siva has more than 1,000 names, which are detailed at length in the 69th chapter of the Siva-Purana.

SIVALIK, or SIWALIK, n. *sĭ-vä'lĭk*, or SEWALIK, n. *sĕ-vä'lĭk* [from *Siva*]: range of Indian hills, otherwise called the Sub-Himalayas, running parallel to the main chain, and generally consisting of two ranges separated by a broad valley, the s. slope overlooking the Ganges.

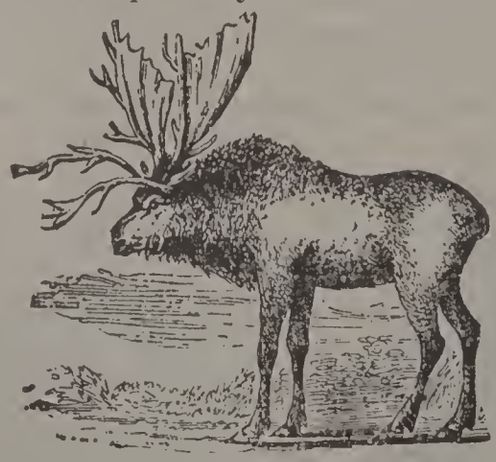
SIVAN, n. *sĭ'văn:* third month of the Jewish ecclesiastical year, including parts of May and June.

SIVAS, or SIWAS, *sē-vâs':* city of Asiatic Turkey, cap. of the pashalic of S., on the Kizil Irmak (anc. *Halys*), 60 m. s.s.e. of Tokat; 4,670 ft. above the Black Sea. S. is named from the anc. *Sebasteia*, on whose site it is built. It covers a large extent of ground, is well built, has numerous old mosques, khans, gardens, and excellent bazaars, manufactures coarse woolens; and has considerable transit trade. Pop. estimated 25,000, of whom about 5,000 are Armenians, the rest Turks.

SIVASH', or PUTRID SEA: see CRIMEA.

SIVATHERIUM, *sĭv-ä-thē-rĭ-ŭm* [*Siva* (q.v.), Indian god; and Gr. *therion*, a wild beast]: remarkable genus of extinct mammals, found in the Miocene strata of the Sewalik Hills, n. India. The species found there, *S. giganteum*, had a large skull, nearly as long as that of an elephant, supported on a neck little short of that of a giraffe, but much stronger. The face was short, and the nasal bones were prolonged into a pointed arch above the external nostrils, indicating the existence of a trunk or proboscis, an organ unknown among the Ruminantia to which it belonged. Like the existing 4-horned antelope of India, it had two small diverging horns, rising from the brow between the orbits, and two large, probably palmated horns, further back. In general appearance, it resembled a huge antelope. By some naturalists, the family

Skull of Sivatherium.



Sivatherium (restored).

Sivatheriidæ has been united with the *Giraffidæ;* by others with the *Antilocapridæ* of N. America.

SIVER, n. *sīv'ĕr* [OF. *essuy*, dried: W. *sych*, dry; *sychu*, to dry: Gael. *sùgh*, moisture: O. Ger. *suyveren*, to cleanse: connected with SEWER, which see]: in *Scot.*, a covered drain; a sewer; applied also to the grating and trap on a street-drain, in which case it might be derived from *sieve* [Dan. *sie*, to percolate, to sink in: Norw. *sika*, to drain off moisture: see SILE].

SI'WAH, or EL-SI'WAH: see AMMONIUM.

SIX, n. *sĭks* [L. *sex;* Gr. *hex;* Goth. *saihs;* Dut. *zes;* Dan. *sex;* Gael. and Ir. *se;* Skr. *shash*, six]: the next in number after five; as a prefix, having six. SIXFOLD, a. six times repeated. SIXPENCE, n. an Eng. silver coin, in value six pennies; half a shilling. SIXPENNY, a. worth sixpence. SIX-SCORE, n. in number, 120; six times twenty. SIX'TEEN, n. *-tēn* [AS. *sixtine*, six + ten sixteen]: six and ten; the number after fifteen. SIX'TEENTH, a. *-tēnth*, the ordinal of sixteen: N. one of sixteen equal parts. SIXTH, a. *sĭkth*, the ordinal of six: N. the sixth part; one of six equal parts; an interval in music. SIXTH'LY, ad. *-lĭ*, in the sixth place. SIXTY, n. *sĭks'tĭ* [AS. *sixtig*, six × ten, sixty]: six times ten; the next after fifty-nine. SIX'TIETH, a. *-tĭ-ĕth*, the ordinal of sixty: N. one of sixty equal parts. SIXTH-RATE, one of the smaller British war-vessels. TO BE AT SIXES AND SEVENS, to be in a state of utter confusion and disorder. ON THIS DAY SIX MONTHS, terms used in the motion of a member in the house of commons to the effect that a bill be indefinitely postponed—since at the date named parliament will not be sitting.

SIX ARTICLES, STATUTE OF: enactment in the 31st year of Henry VIII., passed 1541, June 7, and commonly called the Bloody Statute. Its object was to compel, from all the subjects of the crown, the uniform profession of certain doctrines, six in number, carefully specified in the act. These are (1), the Real Presence of Christ in the Eucharist, and Transubstantiation; (2), sufficiency of communion in one kind only; (3), unlawfulness of the marriage of priests; (4), obligation of vows of chastity; (5), propriety of retaining private masses; (6), expediency and necessity of auricular confession. The penalties of this act exceeded in severity almost every precedent, at least in England; they were severe especially against impugners of the first article—all of whom, whether they dispute, write or preach against it, were to suffer death as heretics, with forfeiture of all their goods to the crown, and without being allowed to abjure the error. With regard to the remaining five articles, the usual penalty of felony is attached to the crime of publicly preaching against them; private impugners are liable for the first offense to imprisonment at the king's pleasure, for the second offense to death; and the same, or nearly the same penalties are enacted against priests or nuns marrying or cohabiting, and against persons contemptuously refusing to confess at the prescribed times, or to receive the sacraments. The act at first was enforced with great severity, but was somewhat mitigated 1544, and was repealed in the first year of the reign of Elizabeth.

SIX NATIONS: confederation of aboriginal Indian tribes inhabiting central and w. New York; known also as Iroquois. The confederation comprised at first 5 nations: Mohawks, Oneidas, Onondagas, Cayugas, Senecas: the Tuscaroras were admitted 1713. The confederation existed at least as early as 1609, when a force of Iroquois suffered defeat at the hands of Champlain and his Huron allies. They made frequent expeditions into Canada 1621–55, and almost obliterated their ancient enemies the Hurons. After the English occupation of New York, the S. N. were the allies of the English in warring against the Illinois, Miamis, and Ottawas; in the war of the revolution they were still on the side of Britain: the Wyoming massacre was the work of these savage allies. There was retaliation 1779, when Gen. Sullivan laid waste their w eantons. At the conclusion of peace the Iroquois migrated in great numbers to Canada where reservations were assigned them. There are (1902) on reserva. in the state of N. Y. 5,318 Indians belonging to the S. N., and in Canada more than 7,000.—The federal polity of the S. N. was somewhat like that of the United States. The people were agriculturists. Each of the nations was divided into tribes, each tribe governed by a 'sachem' elected by the members of the tribe. A head sachem, chosen by the tribes, with a council of seniors, administered the affairs of the federation. Neither the pres. nor the council received any pay or remuneration: the honor of serving their people in the highest post was deemed sufficient recompense. Among the great captains and great councillors of the S. N. were Garakonthie, Dekanisora, Tawerahe, Hendrick, Cornplanter, Farmer's Brother, Brant, Red Jacket, Ganeodiyo (prophet and reformer). For history of the S. N., see Cusick's (a Tuscarora) *Hist. of the S. N.*; Morgan's *League of the Iroquois.*—Also, see INDIANS, AMERICAN: INDIAN TERRITORY.

SIX-PRINCIPLE BAPTISTS: see BAPTISTS, SIX-PRINCIPLE.

SIXTEENMO, n. *sĭks-tēn'mō*, or SEXTO-DECIMO, n. *sĕks'tō-dĕs'ĭ-mō* [L. *sextus-decĭmus*, the sixteenth—from *sextus*, the sixth; *decĭmus*, the tenth]: among *printers*, a sheet folded into sixteen leaves, or thirty-two pages, usually abbreviated into 16mo.

SIXTUS IV., *sĭks'tŭs* (FRANCESCO DELLA ROVERE), Pope of Rome: 1414, July 21—1484, Aug. 13 (pope 1471–84); b. near Savona, Italy; of humble family. He was a scholar of the celebrated Cardinal Bessarion, and became a member of the Franciscan order, in which capacity he obtained high reputation throughout Italy as a preacher. On the death of Paul II. 1471, Rovere was elected to the Roman see. The domestic government of S. has been strongly condemned. His inordinate partiality to his relatives exhausted the papal treasury, and led to many questionable exactions, and to gross abuses in the dispensation of church patronage. His excessive facility, too, in dispensing favors, led to his frequently conferring the same

benifice on more than one individual. But the worst imputation on the memory of his pontificate arises in connection with the political affairs of Florence, especially with the conspiracy against the Medici family, known as the Pazzi conspiracy. In the last act of this nefarious plot, the murder of Giuliano in the church at Florence, S.'s nephew, the prodigal Cardinal Riario was present; and when, after its failure, the leaders, including the Abp. of Pisa, were put to death, S. excommunicated the Duke Lorenzo and all the magistrates of Pisa. Although this censure was passed professedly for the violation of the immunities of the church in putting an ecclesiastic to death, yet it has drawn on S. the suspicion of complicity, or at least of connivance after the fact; and has led to much controversy among historians. The necessities of defense against the Turkish invasion embarrassed still further the finances of the pope, and even Rom. Cath. historians deplore the lengths to which ecclesiastical exactions and the simoniacal distribution of benefices were carried in the latter years of Sixtus. In many respects, nevertheless, his administration was liberal and public spirited. Though not guarding the public treasure from plunder by his relatives, he was without avarice in his own behalf. He did much to foster learning and to encourage art, rewarding scholars and painters; he gained the name of second founder of the Vatican library; and he contributed notably to the improvement and decoration of the city, establishing hospitals, building and endowing churches, constructing the Sixtine Chapel and the Sixtine bridge. In 1482 he entered into an alliance with the Venetians against the Duke of Ferrara, which led to a general Italian war, and ended in a dissolution of the Venetian alliance; thus causing 'the scandal to be witnessed of the secular princes and cities of Italy agreeing to a peace which the Father of Christendom did his best to thwart.' His death is said to have been caused by mortification at the result.

SIXTUS V. (Felice Peretti), Pope of Rome: 1521, Dec. 13—1590, Aug. 27 (pope 1585–90); b. near Montalto, Fermo, Italy; of parents so poor that the legend is that his boyhood was spent in the occupation of a swineherd. A conventual Franciscan father procured the boy's admission into the order. He was ordained priest 1545, and became prof. of theology at Rimini and at Siena. His reputation as preacher led to his being transferred to Rome, where he rose to its first dignities: he became inquisitor-gen. at Venice, and theologian at the council of Trent. He acompanied Cardinal Buoncompagno as theologian in his legative mission to Spain (1565); and on the accession of Pius V. to the pontificate, was made Cardinal Montalto (1570). On the accession of his former patron, Buoncompagno, as Pope Gregory XIII., Cardinal Montalto might have exercised the highest influence; but he went into retirement, and was believed to have fallen almost into the decrepitude of age and infirmity. This appearance was afterwards ascribed by his enemies to design and as concealing his ambitious views; and there is a well-known though

apocryphal story of his having, when elected pope on the death of Gregory, flung aside his crutch, and revealed himself to the astonished and disappointed cardinals in the full vigor of body, mind, and will. His pontificate certainly was most active and energetic, and was marked by vigorous measures of improvement in every department of administration, ecclesiastical and civil. His first care was to repress the prevailing license and disorder of the city of Rome and of the papal states generally, by exterminating the bands of outlaws by which both were infested. His administration in the repression of immorality was stern and even terrible; but the evil was one which demanded even seemingly cruel remedies. He reformed the administration of the law, and the disposal of public patronage; he entered upon numerous and most comprehensive projects for the moral and material improvement of Rome. Many of his great works are still recognizable at Rome under his name; among which are the library buildings of the Vatican, and the supply of Rome with water. A characteristic of his administration, too, was its disinterestedness: he steadfastly refused to use his position for advancing any of his relatives, or to bestow on them property or money derived from the public; and he secured within the first years of his short pontificate a surplus of more than 5,000,000 of crowns in the exchequer previously empty; this end was gained, however, in part by sale of offices and by an excessive taxation, and with the result of impoverishment of the community. In foreign policy, his great aim was, in the strongest sense of the words, to advance the Rom. Cath. Church in every portion of Christendom, against the Huguenots in France, against the Lutherans in Germany, and against Queen Elizabeth in England. At the same time, he entertained deep jealousy and apprehension of the designs of Spain; and he resisted the excessively rigorous measures of the Spanish Inquisition as organized under Philip II. His church administration was equally vigorous and energetic. He fixed the number of the Sacred College of Cardinals at 70; and it was under him that the present organization of separate congregations of cardinals for the several departments received some of its most important developments. S. published a new ed. of the Septuagint, and an ed. of the Vulgate, which has become famous from the multiplicity of its errors, subsequently corrected in the edition of Clement VIII.

On the whole S. was one of the most remarkable men in the modern pontificate—an austere but just magistrate—with genius of high order, usually practical, though at times visionary; and acting with little regard for, and indeed little need of, advice from others. The assertion that he died by poison has not sufficient evidence.—Many of the popular stories regarding S. are derived from Gregorio Lete's *Vita di Sisto V.* (2 vols. Lausanne 1669) a work of no authority. See also Tempesti, *Storia della Vita e Gesti de Sisto V.* (2 vols, Rome 1754); Lorentz, *Sixtus V. und seine Zeit* (Mainz 1852); Ranke, *Fürste und Völker von Süd-Europa*, and Von Hübner, *Sixtus V.* (1874).

SIZAR, *sī'zĕr*, or SIZER [see SIZE 1]: name given to an order of students at Cambridge Univ., and at Trinity College, Dublin, who receive free commons and free tuition. Duties somewhat menial were originally required of the sizars, but these have long since gone into disuse. Sizars are not on the foundation, and therefore so long as they remain such are not eligible for fellowships; but they may at any time become pensioners, and generally sit for scholarships immediately before taking their first degree. If successful, they are on the foundation, and may become candidates for fellowships when they have taken their degree.—At Oxford there is a similar order of students, denominated Servitors.

SIZE, n. *sīz* [contr. of OE. *assize*, a statute regulating the measure and price of commodities (see ASSIZE)]: *literally*, a settled portion of bread; hence, extent of bulk; comparative magnitude; largeness. SIZE, or SI'ZING, n. at *Cambridge University*, food and drink from the buttery in addition to the regular commons: V. to arrange according to bulk or size; to have extra food from the buttery. SI'ZING, imp. SIZED, pp. *sīzd:* ADJ. having a particular magnitude, as large-*sized*, common-*sized*. SIZABLE, a. *sī'zĕ-bl*, of large bulk; of suitable size. SI'ZAR, n. *-zĕr* [OE. *assize*, corrupted into *size*, settlement or arrangement, hence the ordinance for regulating the sale of bread or of fuel, an allowance]: student at a univ. who usually receives food and tuition free, and who formerly waited on the high table at meals (see SIZAR). SI'ZARSHIP, n. *-shĭp*, condition of a sizar.—SYN. of 'size, n.': bulk; magnitude; greatness; dimension; bigness; largeness.

SIZE, n. *sīz* [It. *assisa*, size—from *assidere*, to situate—from L. *assidĕrĕ*, to sit near: Sp. *sisa*, a kind of glue that painters use]: weak soft glue used by painters; gluey varnish used by gilders, paper-makers, and artists (see GLUE: GELATINE): V. to cover with size, or prepare with it. SI'ZING, imp.: N. a kind of glue used in manufactures, arts, etc. SIZED, pp. *sīzd*. SI'ZINESS, n. *-zĭ-nĕs*, the quality of being gluey or viscous. SI'ZY, a. *-zĭ*, thick and viscous; glutinous.

SIZEL, n. *sī'zĕl* [a corruption of SCISSEL, which see]: in *coining*, the residue of bars of silver after pieces are cut out for coins.

SIZZLE, v. *sĭz'l* [a frequent. of *siss*]: to dry or shrivel up with a hissing noise by the action of fire: N. a hissing noise.

SKADDON, n. *skăd'on* [etym. doubt.]: embryo of a bee.

SKAGEN *skâ'ghĕn*, CAPE; or THE SKAW: most northerly point of Jutland, Denmark. On it is a light-house of stone, 67 ft. high, lat. 57° 43′ 8″ n., long. 10° 36′ 5″ e; and near it is a small town (pop. 1,400).

SKAGER-RACK, *skâ'ghĕr-răk* ['Crooked Strait of Skagen;' *rack* is prob. from same root as AS. *raca*, Ger. *rachen*, throat; thus equivalent to Celtic *Kyle* (in Kyles of Bute) L. *gula*, English *gully*—is the *Race* of Alderney allied to *Rack?*], arm of the North Sea (q.v.) between Den

mark and Norway, and communicating with the Cattegat; about 150 m. long from w.s.w. to e.n.e., and 80 m. broad. The depth is much greater on the Norwegian (about 200 fathoms) than on the Danish coast—being on the latter 30 to 40 fathoms, increasing toward the center to about 60. When free from violent storms—to which it is subject—the current runs e. on the side near Denmark, and w. on the side next Norway, the harbors all being on the Norwegian coast.

SKAGWAY, or SKAGUAY: Alaska; city, on Chilkat Inlet, at the head of Lynn Canal. It is at the entrance to White Pass and near Chilkoot Pass; about 180 m. n. of Sitka. It is on the White Pass & Yukon railroad, which with other railroads and with water routes makes a continuous rail and water route from Skagway to Seward Peninsula. There were trading stations in the vicinity, and it may be on the site of the present city, but they were established and abandoned to suit the needs of the traders. The settlement of the present city began in 1897, when a miner from Minneapolis, Minn., opened a wagon road across White Pass from the Canadian gold fields. From a town of tent-cloth dwellings it has become a fairly well-built city, with manufactories and stores to meet the demands of a large number of the mining camps of the interior. In 1899 a college was established with Doctor La Motte Gordon, an Oxford graduate, as president and with 50 pupils in attendance. There are public schools, and Presbyterian, Roman Catholic, Protestant Episcopal, and Methodist churches. Pop. 3,300.

SKAINSMATE, n. *skānz'māt* [Scot. *skean;* Ir. and Gael. *sgian*, a knife]: in *OE.*, a dagger-companion; a fellow cut-throat; a messmate or a companion in a disreputable sense.

SKALD—SKALDIC. See SCALD 2.

SKALITZ, *skâ'lĭts*, or SZAKOLCZA, *sâk-olts'â:* town in n.w. Hungary, near the borders of Moravia, 47 m. n. of Presburg, on the left bank of the March. It is nearly in the form of a square, surrounded by walls; has several Protestant and Roman Catholic churches, a Franciscan monastery, town-hall, etc., besides large manufactures of cloth. Good wine is produced in the vicinity, and hemp is largely grown. Pop. 6,000.

SKAT: an intricate game of cards originating in Germany about the year 1800. Thirty-two cards are used and three or four persons take part in the game, although but three are active players. Each player holds ten cards, two being laid aside for the 'skat.' The use of these two cards determines the game. For a complete description of the game consult Hoffman, *Book of Skat;* Eichhorn, *American Skat.*

SKATE, n. *skāt* [Dut. *schaatsen*, skates: Dan. *sköite;* Sw. *skid*, a skate]: frame of wood, metal, etc., shaped

for fitting on the sole of a boot or shoe, and furnished on its under side with a keel or ridge of steel (often called the blade), used for gliding rapidly on the surface of ice: V. to move on ice by means of skates. SKA'TING, imp.: N. the act or art of gliding or moving on ice by means of skates. SKA'TED, pp. SKA'TER, n. *-tėr*, one who skates. ROLLER-SKATE, skate with small parallel wheels at toe and heel, so hung that the wheel axles can move out of parallel according to the skater's motion—i.e., the wheels set squarely on the surface whether the skater be upright or canted: these skates are for use on floors of wood or asphalt; and were invented by James L. Plimpton, of New York, 1869. The exertion in their use is much greater than in ordinary skating. Many large inclosed rinks were built for this exercise in England and the United States.

SKATE, n. *skāt* [L. *squātus* or *squatĭna*, a species of shark: Icel. *skata*, a skate, from its pointed tail: Norw. *skata*, to run to a point: Ir. and Gael. *sgat*, a skate]: popular name of several species of Ray (q.v.).—The COMMON SKATE (*Raia batis*), known in Scotland as the *Blue Skate* or *Gray Skate*, and in s. England as the *Tinker*, is plentiful on most parts of the British coasts; the breadth of the body is to its length in the proportion of about four to three; the snout sharp; a short hard tubercle in front of each eye, and another on the inner side of each; a single row of spines commencing on the dorsal ridge near the origin of the ventral fins, and reaching along the tail; upper parts grayish brown, belly dusky white with darker lines. It attains a large size, having been known to weigh 200 lbs.—The LONG-NOSED SKATE (*R. rostrata* or *mucronata*) is remarkable for elongation and sharpness of the snout. The upper surface is of light lead color, the lower grayish white. The tail has a row of crooked spines: this species attains a large size.—The SHARP-NOSED SKATE (*R. oxyrhynchus*) also has a very sharp snout, but less elongated: it is thicker in proportion to its other dimensions than any of the other British species, and attains a very great weight. —The FLAPPER SKATE (*R. intermedia*) is very thin and broad; the upper surface is dark olive-green with numerous white spots.—Skates are very voracious. They are often caught by lines and by trawl-nets; and are esteemed for food in most countries, yet on some parts of the British coast they were until recently rejected as worthless. For the North American species of Skate, see RAY.

SKATING: gliding, or moving rapidly, on ice, or other smooth surface. Skating had its origin probably in the far n. of Europe: in Sweden, Denmark, Holland, etc., it is a usual mode of winter travel: in other countries it is generally rather a means of amusement and physical exercise. The great depth of snow in the northern regions of America limits the opportunity for skating: there the

SNOW-SHOE (q.v.) affords the surest means of locomotion in winter. As a pastime, skating is practiced in all civilized countries wherever the climate presents favorable conditions: and by the use of roller-skates (see SKATE) the exercise may be had without regard to season or climate. Originally certain bones of large animals were fashioned into skates: wood also was early used. The first improvement on wooden skates was the addition of a runner or keel of iron or steel. There are in modern skating two distinct styles, which require different kinds of skates and different extents and qualities of ice: these are the 'running' style, and the 'figure skating' style. In running, the one aim is speed. In the running skate the heel is at right angles with the ice; the prow projects 4 in., rising at a gradually increasing angle. Each foot is raised alternately and set down on the inside edge: immediately it takes a forward motion, which is increased by the push of the other foot. The fastest times on record are as follows: 200 yds., 16⅖ sec.; 880 yds., 1 min. 20⅖ sec.; 1 mile, 2 min. 36 sec.; 3 miles, 8 min. 23 sec.; 10 miles, 31 min. 11⅕ sec.; 30 miles, 1 hour 53 min. 20 sec.; 50 miles, 3 hours 15 min. 59⅖ sec.; 100 miles, 7 hours 11 min. 38⅕ sec.—In skates for 'figure skating' the blade projects but a very little beyond the foot, and it is rounded both at toe and heel. Figure skating is practiced frequently in 'rinks' in which shallow artificial ponds are frozen overnight and protected from snow by a roof. Figure skating consists—besides the graceful and stately 'roll'—in cutting arcs, circles, figures, letters, serpentines, and spirals, either forward or backward, slowly or rapidly, on one or both feet, singly or in combination. In this style of skating, the outer edge of the keel or blade is much in use. The standard figures are the '8,' 'grapevine,' 'on to Richmond,' 'double shamrock,' different 'stars,' etc.

SKEAN, n. *skēn* [Gael. *sgian*, a knife]: in *Scot.*, a dirk or dagger; a knife. SKEAN-DHU, n. *skē'ăn-dū* [Gael. *sgiandubh*, a black knife, a dagger—from SGIAN, *skĕ-ăn'*, a knife; *dubh*, black]: in *Scot.*, a short dagger; a dirk; a knife which serves either for stabbing or carving.

SKEAT, *skēt*, WALTER WILLIAM: clergyman of the Church of England, and author: b. London, England, 1835, Nov. 21. He graduated from Christ's College, Cambridge, 1858; two years later became a fellow of this college and was appointed curate of East Dereham; and was again elected fellow of Christ's College 1883. In 1862 he went to Godalming, in Surrey, as curate. He was appointed a mathematical lecturer of Christ's College in 1864, and since 1878 has held the Erlington and Bosworth professorship of Anglo-Saxon in the university. He has made a special study of English etymology and early English literature and has edited for the Early English Text Society a number of works. Skeat's work in the philology of the English language,

especially in its older forms, is of the utmost value, and has contributed much to stimulate interest in such studies. His chief original publications in this department are: *A Mœso-Gothic Glossary* (1868); *Etymological Dictionary of the English Language* (1879-84), his most important work; *Concise Etymological Dictionary of the English Language* (1882; new ed., rewritten and rearranged, 1901); *Principles of English Etymology* (two series, 1887 and 1891); *Primer of English Etymology* (1892), a smaller work based upon the preceding, but dealing only with the native element; *The Chaucer Canon, with a Discussion of the Works associated with the name of Geoffrey Chaucer* (1900); *Place Names of Cambridgeshire* (1901); and *Notes on English Etymology* (1901). Among numerous editions of English texts which he has edited for various societies and publishers may be cited *Lancelot of the Laik* (1865); *Havelok the Dane* (1868); *The Vision of William concerning Piers the Plowman* (1886), giving the three texts parallel, with notes, glossary, etc.; *Æfric's Lives of Saints* (1882-98); Chatterton's *Poems* (1871); *The Works of Chaucer* (with notes, glossary, etc., 1894-5); with a supplementary volume of spurious Chaucerian pieces, 1897); and *The Student's Chaucer* (1895). He founded the English Dialect Society in 1873, and was its chief member during the 23 years of its existence. For it he prepared several provincial glossaries, and upon these and other publications of the society the new *Dialect Dictionary* is based. *A Student's Pastime* (1896) consists of articles contributed by him to *Notes and Queries.* He has also translated Uhland's *Songs and Ballads* (1864).

SKEDADDLE, v. *skĕ-dăd'l* [probably connected with Dut. *schudden,* to shake, to jolt: OE. *scuddle,* to run away all of a sudden]: an Americanism—to act the coward in running away from the post of danger or duty; to betake one's self to flight in a hasty or secret manner; to flee. SKEDAD'DLING, imp. *-lĭng.* SKEDAD'DLED, pp. *-dăd'ld.*

SKEET, n. *skēt* [comp. Ger. *schütten,* to send forth, to pour]: in *ships,* a scoop with a long handle, used to wet the decks and sides of a ship to keep them cool and prevent the splitting of the wood by the heat of the sun.

SKEG, n. *skĕg* [Icel. *skegg,* a beard, the beak or cutwater of a ship]: in *naut.,* a knee which unites and braces the stern-post and keel of a boat: a kind of oats. SKEG-SHORE, n. in *ship-build.,* one of several pieces of plank put up endways under the skeg of a heavy ship, to steady her afterpart a little at the moment of launching.

SKEIN, n. *skān* [OF. *escaigne;* Ir. *sgainne,* a skein of thread: Gael. *sgeinnidh,* flax or hemp, thread]: a quantity of thread or silk yarn coiled together after being taken off the reel—the *skein* containing 80 threads, each 54 inches long.

SKELETON, n. *skĕl'ĕ-tŏn* [Gr. *skelĕtŏn,* a dried body, a mummy—from *skellō,* I make dry: F. *squelette*]: the bones of any animal dried and retained in their natural positions; the bones of an animal separate from its flesh (see below): outline of framework of anything; the heads or outline of a sermon or literary work: a person much emaciated: ADJ. consisting of mere framework; containing mere outlines or heads. SKEL'ETONIZE, v. *-tŏn-īz,* to reduce to the state of a skeleton. SKEL'ETONIZING, imp. SKEL'ETONIZED, pp. *-īzd.* SKELETOLOGY, n. *skĕl-ĕ-tŏl'o-jĭ,* in *med.,* branch of anatomy which treats of the skeleton. SKELETON-KEY, a thin light key with nearly the whole center parts filed away. SKELETON IN THE CUPBOARD, any unpleasant personal or family secret.

SKEL'ETON: term denoting, in its largest sense, 'a more or less firm and complete *external* protection to a living body, also a more or less firm and complete *internal* support to such body' (*St. George Mivart*). External protection is afforded by the *Exoskeleton,* internal support by the *Endoskeleton.* In the invertebrate animals, the skeleton, except in the case of certain corals, is tegumentary or dermal, forming the outer hard and protective covering, as in the *Echinodermata, Mollusca,* and *Crustacea;* and, like the epidermis and its appendages, is non-vascular, and can be increased only by additions to its edges. This hard insensible covering serves to protect the animal from hurtful external influences, and to afford fixed points of attachment to the muscles which move the body and limbs; the muscles, however, always lying interior to the skeleton, and not clothing it, as we see in the Vertebrata. We scarcely ever observe, among the Invertebrata, that the skeleton bears any definite relation to the nervous system, which is merely protected by it to the same extent as the other soft tissues.

The external skeleton or *Exoskeleton* is formed from the two layers of the integument—the *epidermis,* a superficial, non-vascular substance, composed of cells constantly growing and multiplying in the deeper, and being thrown off in the superficial, layers; and the *dermis* or true skin, composed of more or less completely formed connective tissue: an exoskeleton may be formed by the hardening of either of these layers. The development of each is described substantially as follows by Prof. Huxley:

The *Epidermal Exoskeleton* results from conversion into horny matter (cornification) of the superficial cells of the epidermis. The horny plates thus formed are molded upon, and follow the configuration of the dermis, with its processes. When the latter are overlapping folds, the horny epidermic investment is called a *scale.* When the dermic process is papilliform and sunk in a pit of the dermis, the conical cap of modified epidermis which coats it is either a *hair* or a *feather:* to become a hair, the horny cone simply elongates by continual addition of new cells to its base; but in a feather the horny cone, which also

elongates by addition to its base, splits up for a greater or less distance along the middle line of its under surface, and then spreads out into a flat vane, subdivided into *barbs*, *barbules*, etc. The epidermis remains soft and delicate in fishes and *Amphibia*. In *Reptilia* it sometimes takes the form of plates, which attain great size in many *Chelonia* (tortoises and turtles); sometimes that of overlapping scales in snakes and many lizards; but sometimes it remains soft, as in chameleons and many *Chelonia*. Epidermic plates in the form of *nails* appear on the terminal phalanges of the limbs. All *Aves* possess feathers; and in them, as in some *Reptilia*, the beak is partly or totally ensheathed in horn. Cornified epidermal tubercles or plates are developed on the tarsi and toes, the terminal phalanges of which have nails; and some birds have spurs, ensheathed in horn, on the legs or on the wings. In *Mammalia* the horny exoskeleton may assume all the forms above mentioned, except that of feathers. In some *Cetacea* it is almost absent, being reduced to a few hairs, present only in the fetal state. On the other hand, the pangolin (*Manis*) is almost completely covered with scales, the armadillos with plates, and most terrestrial mammals with a thick coat of hair. The greater part of the mass of the horns in oxen, sheep, and antelopes is due to the epidermic sheath that covers the bony core. Where the horny epidermis becomes very thick, as in the hoof of the horse and in the horn of the rhinoceros, numerous long papillæ of the dermis extend into it. These papillæ, however, are comparable to the ridges of the bed of the nail, not to the papillæ of the hairs.

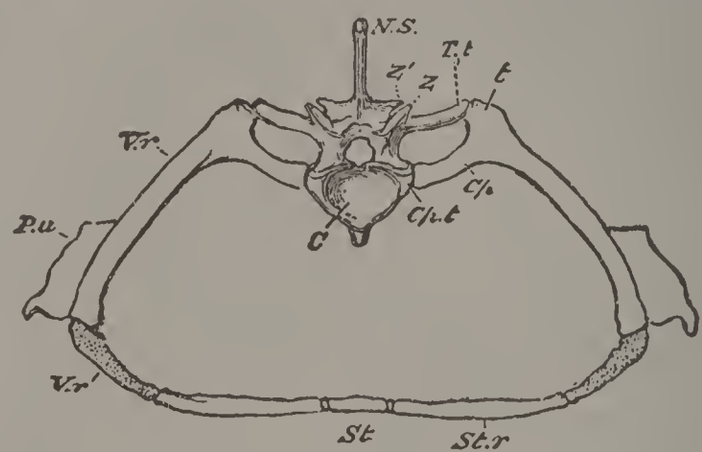
The *Dermal Exoskeleton* arises from the hardening of the dermis; in the majority of cases by the deposit of bone-earth in more or loss completely formed connective tissue, though the resulting hard tissue has by no means always the structure of bone. It may happen that cartilage is developed in the dermis, and, either in its primary state or ossified, gives place to exoskeletal parts. No dermal exoskeleton (except that of the fin-rays) exists in the lowest fishes, *Amphioxus* and the *Marsipobranchii*. In most *Teleostei* the integument is raised up into overlapping folds, and in these calcification takes place in laminæ, of which the oldest is the most superficial and lies immediately beneath the epidermis. As a general rule, the calcified tissue of the 'scale' thus formed does not possess in the *Teleostei* the structure of true bone. But in other fishes the dermal calcification may consist of true bone (as in the sturgeon); or, as in the rays and sharks, may take on the structure of teeth, and consist of a matter comparable to dentine.—A form of dermal exoskeleton characteristic of fishes is seen in the fin-rays. These are developed in the integument either of the median line of the body or in that of the limbs. In the former case they usually enter into, or support, folds of the integument usually termed *dorsal*, *caudal*, or *anal* fins. Ordinary fin-rays are composed of a horn-like or more or less calcified substance. The *Amphibia* generally are devoid of dermal exoskeleton, but some of them (*Cæciliæ*) have scales like those of fishes. The *Ophidia*

have no dermal exoskeleton. Many lizards have bony dermal plates in size and form corresponding to the epidermal scales. All *Crocodilia* have bony plates in the dorsal region of the body and tail; in some they are developed in the ventral region. In the *Mammalia* the development of a dermal exoskeleton is very rare, occurring only in the loricated *Edentata*.

The *Endoskeleton* consists of connective tissue, to which cartilage and bone may be added in various proportions; together with the tissue of the notochord, which cannot be classed under either of these heads. The endoskeleton is distinguishable into two independent portions—the one *axial*, or belonging to the head and trunk; the other *appendicular*, to the limbs. The *axial* endoskeleton usually consists of two systems of skeletal parts, the *spinal* system and the *cranial* system. For the development of the cranial system, see SKULL. The development of the spinal system in the higher *Vertebrata* is as follows: The first essential differentiation between the skull and the vertebral column is effected in the appearance of the *protovertebræ*. At regular intervals, commencing at the anterior part of the cervical region, and gradually extending backward, the indifferent tissue on each side of the notochord undergoes a histological change, and gives rise to more opaque, quadrate masses, on opposite sides of the notochord: each pair of those gradually unite above and below that structure, and send arched prolongations into the walls of the spinal canal, so as to constitute a protovertebra. The protovertebræ consist at first of mere indifferent tissue; and it is by a process of histological differentiation within the protovertebral masses that from its deeper parts one of the *spinal ganglia* and a *cartilaginous vertebral centrum*, and from its superficial layer a *segment of the dorsal muscles*, are produced. Chondrification (process of turning into cartilage) extends upward into the walls of the dorsal tube, to produce the *neural arch* and *spine* of each vertebra; and outward into the wall of the thoracic and abdominal part of the ventral tube, to give rise to the *transverse processes* and *ribs*. In fishes the latter remain distinct and separate at their distal ends; but in most reptiles, in birds, and in mammals the ends of some of the anterior ribs on both sides unite, and then the united parts coalesce in the middle line to form a median subthoracic cartilage—the *sternum*. When Ossification (q.v.) sets in, the centra (or bodies) of the vertebræ are usually ossified, in great measure, from ring-like deposits that closely invest the notochord; the arches from two lateral deposits which may extend more or less into the centrum. The vertebral and the sternal portions of a rib may each have a separate centre of ossification, and become distinct bones; or the sternal parts may remain always cartilaginous. The sternum itself is variously ossified. Between the completely ossified condition of the vertebral column and its earliest state are many gradations, most of which are more or less completely realized in the adult conditions of certain vertebrated animals. The vertebral column may be represented by nothing but a

notochord with a structureless, or more or less fibrous, or cartilaginous sheath, with or without rudiments of cartilaginous arches and ribs. Or there may be bony rings or ensheathing ossifications in its walls; or it may have ossified neural arches and ribs only, without cartilaginous or osseous centra. The vertebræ may be completely ossified, with very deeply biconcave bodies (centra), the notochord persisting in the doubly conical intervertebral substance; or ossification may extend so as to render the centrum concave on one surface and convex on the other, or even convex on both ends. A vertebra is *amphicœlous* [Gr. *amphi*, at both ends; *koilos*, hollow] when its centrum is concave at both ends; when it has a concavity forward and a convexity hindward, it is *procœlous* [Gr. *pro*, forward]; where this latter position of concavity and convexity is reversed, the vertebra is *opisthocœlous* [Gr. *opisthe*, behind]. In *Mammalia* the centra are usually flat at each end, the terminal faces being discoidal *epiphyses* developed from centres of ossification distinct from that of the centrum itself. The centra may be united to each other by synovial joints or by ligamentous fibres—the *intervertebral ligaments*. The arches are connected by ligaments, generally also by overlapping articular processes called *zygapophyses* or oblique processes [Gr. *zugon*, that which joins two bodies; *apophusis*, process]. In very many mammals the first and second cervical vertebræ—the *atlas* and the *axis*—undergo a singular change: the central ossification of the body of the atlas does not coalesce with its lateral and inferior ossifications, but either persists as a distinct *os odontoideum* [L. *os*, bone; Gr. *odontoides*, tooth-like], or anchyloses with the body of the axis, and becomes the *odontoid process* of this vertebra. In vertebrates with well-developed hind-limbs, one or more vertebræ at the posterior part of the trunk usually become peculiarily modified, and give rise to a *sacrum*, with which the pelvic arch is connected by the intermediation of expanded and anchylosed ribs. The verterbæ in front of the sacrum are known as *cervical*, *dorsal*, and *lumbar*. The first vertebra that has ribs connected with the sternum is *dorsal*, as are all those behind it that have distinct ribs. Vertebræ without distinct ribs, between the last dorsal and the sacrum, are *lumbar*. Vertebræ with or without ribs, in front of the first dorsal, are *cervical*. The vertebræ posterior to the sacrum are *caudal* or coccygeal: very frequently, downward processes of these vertebræ inclose the backward continuation of the aorta, and may be separately ossified as *subcaudal*, or chevron, bones. A tolerably complete segment of the spinal skeleton is seen in the anterior part of the thorax of a crocodile. It presents a procœlous vertebral centrum (*C.*); united with which by the *neurocentral suture* is the *neural arch*, which rises into the *neural spine* (*N.S.*). Two processes, the *prezygapophyses* (*Z*), extend from the front part of the arch, and have flat articular surfaces turned dorsally. Two others of similar form, but having their articular surfaces turned ventrally, proceed from the posterior face of the neural arch, and are the *postzygapophyses* (*Z*).

By these, which are often called oblique, or articular, processes, the vertebra articulates with the corresponding processes of its predecessor or successor in the series. The *transverse processes* are two on each side, one superior and one inferior. The former (*T.t*) articulates with the *tuberculum* of the rib, the latter (*Cp.t*) with its *capitulum*. They may therefore be called *capitular* and *tubercular transverse processes* respectively. Each rib is divided by an articulation into a vertebral (*V.r*) and a sternal (*St.r*) part. The former remains unossified for a considerable distance at its



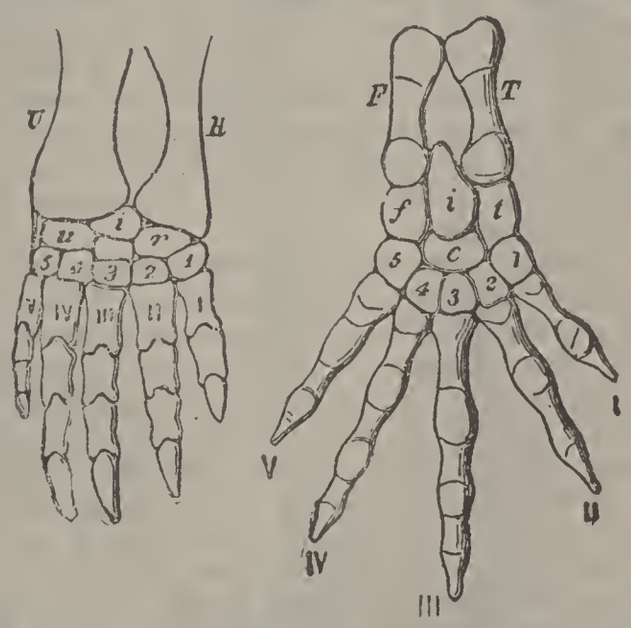
Segment of the endoskeleton in the anterior thoracic region of the body of a crocodile:

C, centrum or body of the vertebra; *N.S.*, neural spine; *Z*, prezygapophysis; *Z'*, postzygapophysis; *T.t*, transverse process which articulates with the tuberculum of the rib (*t*); *Cp.t*, that which articulates with the capitulum of the rib (*Cp*); *V.r*, ossified vertebral rib; *V.r'*, the part of the vertebral rib that remains cartilaginous; *St.r*, sternal rib; *St*, artificially separated segment of the sternum; *P.u*, uncinate process.

distal end (*V.r'*); the latter is more or less converted into cartilage bone. The proximal end of the vertebral rib bifurcates into a *tuberculum* (*t*) and a *capitulum* (*Cp*). The distal end of the sternal rib unites with the more or less ossified but unsegmented cartilage, which forms the sternum (*St*). A cartilaginous, or partly ossified, *uncinate process* (*P.u*) projects from the posterior edge of the vertebral rib, over the intercostal space. In the majority of the *Vertebrata*, the caudal vertebræ gradually diminish in size toward the extremity of the body, and become reduced, by the non-development of osseous processes or arches, to mere centra. But in many fishes which possess well-ossified trunk-vertebræ, no distinct centra are developed at the extremity of the caudal region, and the notochord, invested in a more or less thickened, fibrous, or cartilaginous sheath, persists.

Appendicular Endoskeleton.—In all vertebrated animals the limbs first appear as buds on each side of the body: in all except fishes, these buds become divided by constrictions into three segments, of which the proximal is called *brachium* in the fore-limbs, *femur* in the hind; the middle is called *antebrachium*, or *crus*; the distal, *manus*, or *pes*. The proximal division normally contains one bone only, *os humeri* (or simply *humerus*) in the *brachium*, and *os femoris*

(or *femur*) in the thigh; the middle has two bones side by side, *radius* and *ulna*, and *tibia* and *fibula;* the distal division has many bones, so disposed as to form not more than five longitudinal series except in the *Ichthyosauria*, where marginal bones are added, and some of the digits bifurcate. The skeletal elements of the manus and pes (*hand* and *foot*) are divisible into a proximal set, constituting the *carpus*, or *tarsus*, and a distal set, the *digits*, of which there are normally five, articulated with the distal bones of the carpus and tarsus. Each digit has a proximal *basi-digital* (*metacarpal* or *metatarsal*) bone, upon which follows a linear series of *phalanges*. It is convenient always to count the digits in the same way, commencing from the radial or tibial side: thus, in Man the thumb (pollex) is the first digit of the hand, and the great toe (hallex) the first digit of the foot. When least modified, the carpus and tarsus seem composed of skeletal parts alike in number and in arrangement. One of these, primitively situated in the centre of the carpus or tarsus, is termed the *centrale;* on the distal side of this are five *carpalia* or *tarsalia*, which articulate with the several metacarpal or metatarsal bones; on its proximal side are three bones—one *radiale* or *tibiale*, articulating with the radius or tibia; one *ulnare* or *fibulare*, with the ulna or fibula; and one *intermedium*, between the foregoing. Carpal and tarsal bones, or cartilages, thus disposed are seen in some *Amphibia* and *Chelonia* (see fig.),



Right fore-foot of the Chelonian *Chelydra*, and right hind-foot of the Amphibian *Salamandra:*

U, ulna; *R* radius; *F*, fibula; *T*, tibia. Proximal carpal bones: *r*, radiale; *i* intermedium; *u*, ulnare; the middle unlettered bone is the centrale. Proximal tarsal bones: *t*, tibiale, *i*, intermedium; *f*, fibulare; 1, 2, 3, 4, 5, distal carpalia and tarsalia; I., II., III., IV., V. digits.

but commonly the typical arrangement is disturbed by suppression of some of these elements, or their mutual coalescence. Thus, in the carpus of Man, the radiale, intermedium, and ulnare are represented by the *scaphoides*, *lunare*, and *cuneiforme* respectively. The centrale is not

represented in a distinct shape, having probably coalesced with the other elements of the carpus. The fourth and fifth carpalia have coalesced, and form the single *unciforme.*

Position of the Limbs.—In their primitive position, the limbs are straight, directed outward, at right angles to the axis of the body; but as development proceeds, they become bent in such a manner that, first, the middle division of each limb is flexed downward and toward the middle line, upon the proximal division; while the distal division takes an opposite bend on the middle division. In many *Amphibia* and *Reptilia* the limbs of the adult do not greatly depart from this primitive position; but in birds and in mammals further changes occur. Thus, in all ordinary quadrupeds the brachium is turned backward and the thigh forward, so that both elbow and knee lie close to the sides of the body. Then, too, the fore-arm is flexed on the arm, and the leg on the thigh. In Man a still greater change occurs. In the natural erect posture the axes of both arm and leg are parallel with the axis of the body, instead of perpendicular to it. The proper ventral surface of the brachium looks forward, and that of the thigh backward, while the dorsal surface of the latter looks forward. The dorsal surface of the antebrachium looks outward and backward, that of the leg directly forward. The dorsal surface of the manus is external, that of the pes superior. Thus, speaking broadly, the back of the arm corresponds with the front of the leg, and the outer side of the leg with the inner side of the arm, in the erect position. Among terrestrial mammals the most striking changes of the manus and pes arise from the gradual reduction in number of the perfect digits from the normal number (5) to 4 (in *Sus*), 3 (in *Rhinoceros*), 2 (in most *Ruminantia*), and 1 (in *Equidæ*).

Pectoral and Pelvic Arches.—The proximal skeletal elements of each pair of limbs (*humeri* or *femora*) are supported by a primitively cartilaginous *pectoral* or *pelvic* girdle, which lies external to the costal elements of the vertebral skeleton. This girdle may consist of a simple cartilaginous arc (as in Sharks and Rays), or it may be complicated by subdivisions and additions. The pectoral arch may be connected with the skull or with the vertebral column by muscles, ligaments, or dermal ossifications, though primitively it is perfectly free from both; but it is never united with the vertebræ by the intermediation of ribs. The pelvic, like the pectoral arch, at first consists of a simple continuous cartilage on each side, which, in *Vertebrata* higher than fishes, is divided by the *acetabulum*, or articular cavity for the reception of the head of the femur, into a dorsal and a ventral cavity. Three separate ossifications usually take place in this cartilage—one in the dorsal and two in the ventral half. Hence the pelvic arch eventually consists of a dorsal portion, called *ilium*, and of two ventral elements, the *pubis* anteriorly, and the *ischium* posteriorly. In Fishes the limbs have an endoskeleton which only imperfectly corresponds with that of the higher *Vertebrata;* for while homologues of the cartilaginous, and

SKELETON.

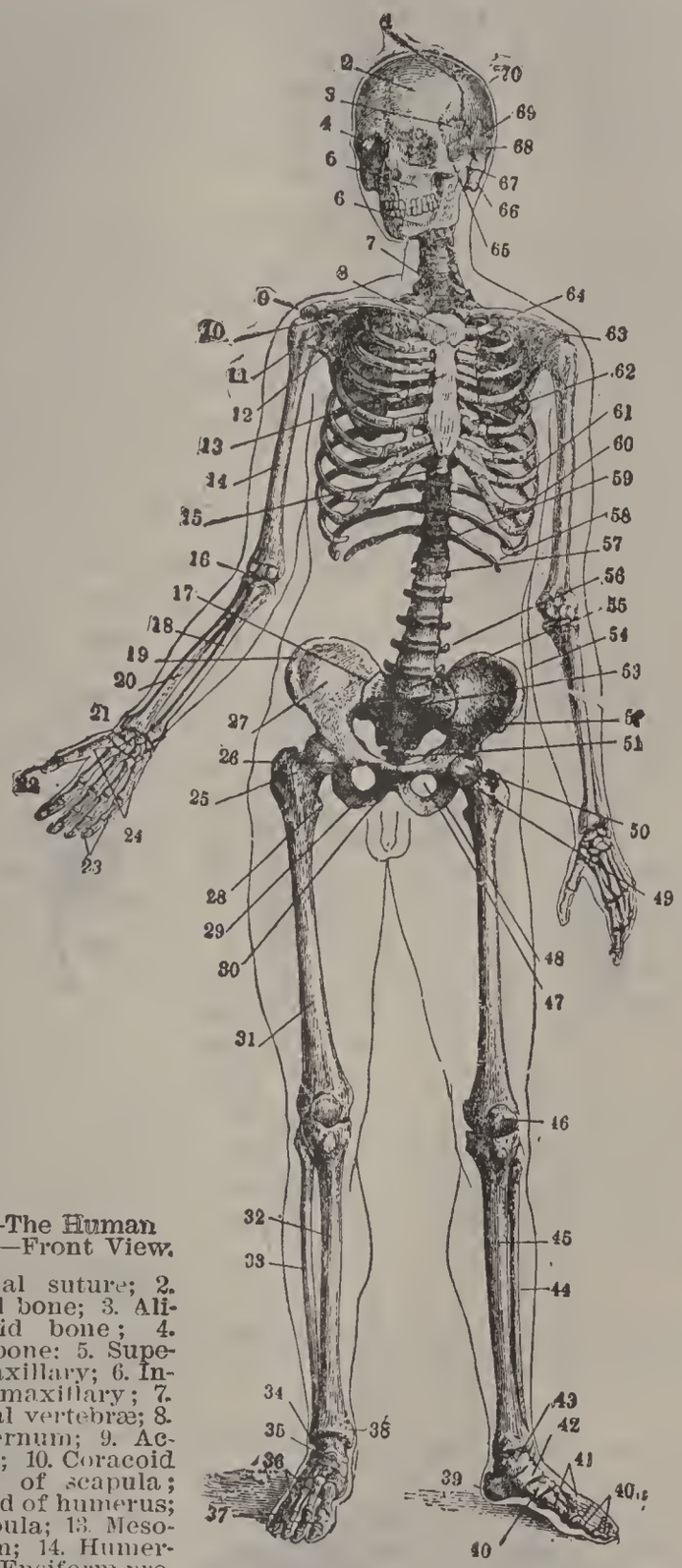


Fig. 1.—The Human Skeleton—Front View.

1. Coronal suture; 2. Frontal bone; 3. Alisphenoid bone; 4. Nasal bone: 5. Superior maxillary; 6. Inferior maxillary; 7. Cervical vertebræ; 8. Præ-sternum; 9. Acromion; 10. Coracoid process of scapula; 11. Head of humerus; 12. Scapula; 13. Mesosternum; 14. Humerus; 15. Ensiform process of sternum; 16. Elbow-joint; 17. Ilio-sacral articulation; 18. Ulna; 19. Crest of ilium; 20. Radius; 21. Carpus; 22. Pollex; 23. Phalanges; 24. Metacarpals; 25. External trochanter; 26. Os pubis; 27. Ilium; 28. Internal trochanter; 29. Tuberosity of ischium; 30. Pubic symphysis; 31. Femur; 32. Tibia; 33. Fibula; 34. Internal malleolus; 35. Tarsus; 36. Metatarsals; 37. Phalanges; 38. Internal malleolus; 39. Os calcis; 40. First cuneiform bone; 40a. Phalanges; 41. Metatarsals; 42. Scaphoid; 43. Astragalus; 44. Fibula: 45. Tibia; 46. Patella; 47. Obturator foramen; 48. Ischium; 49. Neck of femur; 50. Head of femur; 51. Coccyx; 52. Sacrum; 53. Base of sacrum; 54. Crest of ilium; 55 5th lumbar vertebra; 56. Transverse process; 57. 1st lumbar vertebra; 58. 12th (5th false) rib; 59. 12th thoracic vertebra; 60. 8th (1st false) rib; 61. 7th rib; 62. Costal cartilage: 63. 1st rib; 64. Clavicle; 65. Zygoma; 66. Mastoid process; 67. Temporo-maxillary joint; 68. Glenoid fossa; 69. Squamoso-temporal: 70 Parietal.

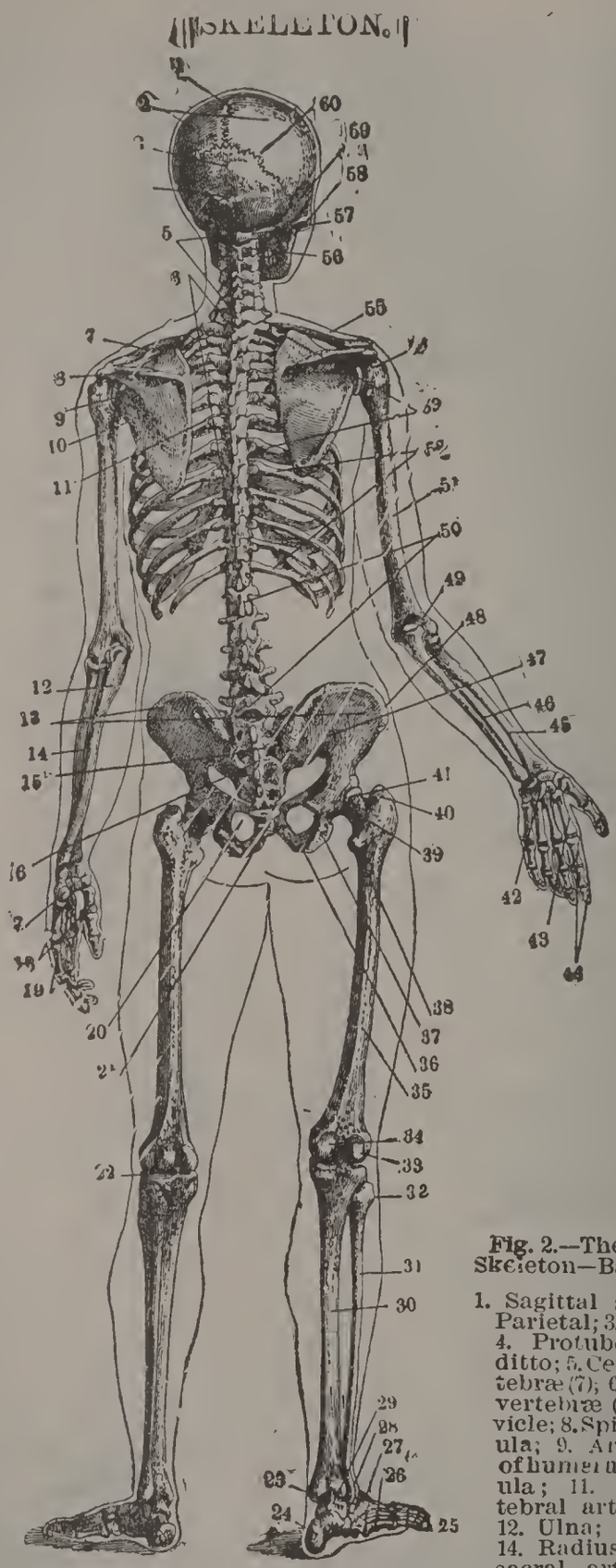


Fig. 2.—The Human Skeleton—Back View

1. Sagittal suture; 2. Parietal; 3. Occipital; 4. Protuberance of ditto; 5. Cervical vertebræ (7); 6. Thoracic vertebræ (12); 7. Clavicle; 8. Spine of scapula; 9. Articulation of humerus; 10. Scapula; 11. Costo-vertebral articulation; 12. Ulna; 13. Pelvis; 14. Radius; 15. Ilio-sacral articulation; 16. Sacrum; 17. Carpals; 18. Metacarpals; 19. Phalanges; 20. Obturator-foramen; 21. Coccyx; 22. Knee-joint; 23. Internal malleolus; 24. Os calcis; 25. Phalanges; 26. Metatarsals; 27. Tarsus; 28. External malleolus; 29. Astragalus; 30. Tibia; 31. Fibula; 32. Head of Fibula; 33. External condyle; 34. Internal condyle; 35. Femur; 36. Tuberosity of ischium 37. Ischium; 38. Internal trochanter; 39. Neck of femur; 40. External trochanter; 41. Articulation of femur; 42. Carpus; 43. Metacarpus; 44. Phalanges; 45. Radius; 46. Ulna; 47. Ilium; 48. Crest of ilium; 49. Olecranon; 50. Lumbar vertebræ; 51. Humerus; 52. False ribs (8th—12th), 53. Ribs—true (1st—7th); 54. Head of humerus; 55. Clavicle; 56. Atlas; 57. Axis; 58. Zygoma; 59. Squamous portion temporal bone; 60. Lambdoidal suture.

even of the bony, constituents of the pectoral and pelvic arches of the latter are traceable in Fishes, the cartilaginous, or ossified, basal and radial supports of the fins themselves cannot be identified, unless in the most general way, with the limb-bones, or cartilages, of the other *Vertebrata.*

The number of separate bones in the *Human Skeleton* is usually reckoned as 206—the 32 teeth not being included. For the physical and chemical constitution of the parts of the skeleton, see BONE; CARTILAGE; OSSIFICATION. The bones of the human skeleton are divided by anatomists into three classes—long, flat, and irregular. The long bones constitute the skeleton of the extremities, and consist of a shaft of hard dense tissue, usually hollow and filled with marrow. The flat bones and the irregular bones usually inclose cavities—as the brain-case, the chest, the abdomen. They consist of two layers of dense tissue, with a spongy tissue between. The bones are classed also with regard to the region of the skeleton occupied by them. Thus, the SKULL (q.v.) has 22 bones, of which 8 belong to the cranium (cranial bones) and 14 to the face (facial bones). In the trunk are 54 bones, of which 50 belong to the neck, thorax, and abdomen, and 4 to the PELVIS (q.v.). The bones of the upper extremities (arms) number 64, and those of the lower extremities (legs) 60. Also there are the ossicles of the tympanum, 6 (see EAR). The accompanying plates exhibit all these in their places in the skeleton or separately. For a detailed account of each, see the several titles, e.g., CLAVICLE; FOOT; HAND; HYOID BONE; LEG; SCAPULA; SPINAL COLUMN; etc.

SKELLIGS, *skĕl'lĭgz,* THE: three rocky islands on the w. coast of Ireland, about 8 m. w. of Bolus Head, county Kerry; long. 10° 32′ w. The lights on the Great Skellig are the first visible to ships crossing the Atlantic.

SKELLUM, n. *skĕl'ŭm* [Dan. *skielm,* a rogue: Dut. and Ger. *schelm,* a rogue]: in *Scot.* and *OE.,* a rogue; a villain; a scoundrel.

SKELP, n. *skĕlp* [etym. doubt.]: a strip of iron which is bent and welded into a tube to form a gun-barrel or pipe.

SKELTON, *skĕl'ton,* JOHN: early English satirical poet: prob. about 1460-1529; b. in Norfolk or in Cumberland. He studied at Cambridge and Oxford, and received from each the academical honor of laureate. His sovereign, Henry VII., appointed him tutor to Prince Henry, afterward King Henry VIII.; and Erasmus styled him the light and grace of British scholars. He became a priest 1498, and was rector of Diss in Norfolk, shortly after which he seems to have struck into his unique vein of original vernacular poetry addressed to the multitude, which has given him his place as one of the most eccentric writers in literature. It consists in a flow of rattling voluble verse, unrestrained satire and jocularity, and a

profusion of grotesque imagery mixed with Latin and slang phrases. He often indulges in ribaldry and buffoonery. At times he has gleams of bright fancy and snatches of pleasant description. Of this higher class is his *Philip Sparrow*, a poetical lamentation by a young maiden (whose charms the poet describes with great gusto and minuteness) over the loss of a pet bird slain in a convent of black nuns. The most humorous of his pictures of low life—often coarse—are in *The Tunning* [or Brewing] *of Elynor Rummyng*, an alewife at Leatherhead in Surrey. This poem was highly popular, and was often reprinted in black-letter, garnished with a rude wood-cut representation of the fat hostess. His best satires are *Colin Clout* and *Why come ye not to Court?* The former is a general satire on the clergy; and the latter a merciless and virulent attack on Cardinal Wolsey, whom the unscrupulous poet had previously flattered, but who had disappointed him of a prebend which he coveted. In this scurrilous lampoon, Wolsey is not only charged with arrogance, avariciousness, and incontinence, but is reminded of his 'base original' and 'greasy genealogy,' having been 'cast out of a butcher's stall.' The enraged cardinal ordered his libeller to be arrested; but Skelton took refuge in the sanctuary at Westminster, and received the protection of Abbot Islip. From this retreat he did not dare to emerge, and remained silent till his death. The 'pithy, pleasaunt, and profitable workes of Maister Skelton, Poete Laureate,' were collected and published 1568, reprinted 1736. A careful edition, by the Rev. A. Dyce, was issued 1843, 2 vols. 8vo.

SKEP, n. *skĕp*, or SKIP, n. *skĭp* [Gael. *sgeap*, a beehive: AS. *scep*, a basket]: wooden or wicker-work vessel, wide at top, coarse basket: a definite measure of capacity: in *manufacture*, leather basket for carrying bobbins of yarn in a spinning-mill: bee-hive: in *mining*, iron box running between guides, for raising ore—in this sense written *skip*.

SKEPTIC, or SCEPTIC, n. *skĕp'tĭk* [F. *sceptique*, a skeptic—from mid. L. *sceptĭcus*—from Gr. *skeptĭkos*, thoughtful, reflective, pertaining to those who took nothing for granted—from Gr. *skep'tomai*, I consider]: *primarily*, one who thinks for himself and accepts nothing on the testimony of others; one who doubts or denies the existence of God, of a revelation, or the truth of any system of principles or doctrines. SKEP'TIC, a. *-tĭk*, or SKEP'TICAL, a. *-tĭ-kăl*, doubting, or hesitating to admit, the certainty of doctrines or principles; unbelieving. SKEP'TICALLY, ad. *-lĭ*. SKEP'TICALNESS, n. *-nĕs*, the state of being skeptical. SKEP'TICISM, n. *-sĭzm*, universal doubt; unbelief in any particular doctrine or system (see below).—SYN. of 'skeptic, n.': unbeliever; doubter; agnostic; infidel; freethinker.

SKEP'TICISM, or SCEP'TICISM: strictly, that condition of the mind before it has arrived at conclusive opin-

ions—while still reflecting, examining, or pondering over subjects of thought. Skepticism is therefore the opposite of dogmatism (see DOGMA). The notion of 'disbelief' is quite a secondary, though now very common, meaning of the term. Among the Greeks a *skeptikos*, 'skeptic,' was originally only a thoughtful person, and the verb *skeptomai* never acquired any other signification than 'to consider.' But inasmuch as the mass of men rush to conclusions with haste, and assert them with far more positiveness than their knowledge warrants, the discerning few of clearer vision or cooler head are often brought into collision with popular beliefs—especially in religion, the sphere in which popular beliefs are most numerous, most positive, and most inconsiderate; and are compelled by the violent shock given to their reason to 'doubt,' it may be to 'disbelieve' (not necessarily to 'deny'), what they hear affirmed by the multitude with indefensible emphasis of speech. Thus in common parlance a skeptic has come to mean an infidel, and skepticism infidelity. But the field of thought in which skepticism properly so called has preferred to exercise itself is not religion, but philosophy. Philosophical skeptics in all ages and countries have generally denied or at least doubted the trustworthiness of the senses and of reason, either separately or taken together, as vehicles of truth, and so have destroyed the very possibility of knowledge. In ancient times, Gorgias, Antisthenes, and Pyrrho; in modern, David Hume, are the most characteristic representatives of this kind of skepticism.

SKERRY, n. *skĕr'rĭ*, SKER'RIES, n. plu. *-rĭz* [Icel. *sker*, a rock: Ger. *schere*, a rock, a cliff: Gael. *sgeir*, a rock in the sea]: rocky isle; a reef. THE SKERRIES, small islands about 2 m. off the n.w. coast of Anglesey, Wales, having a light-house 117 ft. high. See also PENTLAND FIRTH.

SKERRYVORE, *skĕr-rĭ-vōr'*: chief rock of a reef about 10 m. s.s.w. of the s.w. point of the island of Tiree (q.v.), 24 m. w. of Iona. This reef, which stretches 8 to 10 m. w.s.w., is composed of compact gneiss, worn smooth by constant action of the waves; and was long a terror to mariners, having caused the loss of one ship annually for 40 years previous to 1844. The difficulty of landing on the rock, from the immense force (three tons to the superficial foot) with which the Atlantic waves beat upon it, delayed the building of a light-house till 1834, when designs and preparations were made by Alan Stevenson, who began operations on the rock 1838, following generally the mode adopted by his father, Robert Stevenson, in constructing the Bell Rock Light-house. The work was finished 1844. The light-house is 138½ ft. high; at the base 42 ft., at the top 16 ft., in diameter. The revolving light is visible 18 m. The cost was nearly £87,000. Skerryvore Light-house is nearly two-fifths higher than that on Bell Rock, and more than twice as high as the Eddystone. A small group of rocks belong-

ing to this reef, and 3 m. w. of the light-house, is known as Stevenson's Rocks.

*SKETCH, n. *skĕch* [Dut. *schets*, a sketch—from It. *schizzo*, an outline or sketch—from L. *schedĭus;* Gr. *schedĭŏs*, made hastily]: a rough dash or outline; the rough or first draught of any plan or design; a slightly executed picture, in which the general effect is attended to, but not the details: V. to draw the outline or general figure of; to make a rough draught of; to plan; to delineate. SKETCH'ING, imp.: N. the art of copying from nature for a finished work; the art or practice of copying in outline. SKETCHED, pp. *skĕcht*. SKETCH'ER, n. *-ėr*, one who sketches. SKETCH'Y, a. *-ĭ*, containing an outline only; slightly finished; incomplete. SKETCH'ILY, ad. *-ĭ-lĭ*. SKETCH'INESS, n. *-nĕs*, the state of being sketchy; incompleteness. SKETCH-BOOK, a book formed of drawing-paper, used for sketching in.—SYN. of 'sketch, n.': outline; delineation; plan; draught; diagram;—of 'sketch, v.': to depict; paint; draw; portray; design.

SKEW, a. *skū* [Ger. *schief;* Dut. *scheef;* Icel. *skeifr;* Dan. *skiev*, oblique, wry: comp. Gr. *skaios;* L. *scævus*, left]: wry; distorted; oblique; intersected at an angle greater or less than a right angle: N. in *masonry*, an oblique arch; anything sloping from another at an obtuse angle, e.g., a sloping water-table, as on the set-off of a buttress, cope of a gable, etc. The large stone at bottom is called the skew-put or skew-corbel. SKEW, v. in *OE.*, to form in an oblique way; to look obliquely; to squint. SKEW-BACK, an abutment which slopes to receive the arch. SKEW-BALD, a. piebald, applied to horses. SKEW BRIDGE, a bridge carrying a road or railway over and above another road, canal, or river not at right angles to it, but at some other angle, in order better to maintain the directness of the new track. Such bridges are not easy of construction in stone, owing to the peculiar twisted forms which the voussoirs assume, and were scarcely ever used till the necessities of railway curves compelled their introduction. They are evidently a great improvement on the earlier mode of twisting a road, first to the right, then to the left, in order to bring the bridge at right angles to the place to be crossed. Since introduction of iron girders as supports of bridges, skew bridges have become easy of construction, and are in general use.

SKEWER, n. *skū'ėr* [Sw. *skifva;* Icel. *skifa*, a slice]: a pin of wood or iron for fastening meat to a spit, or for keeping it together while roasting: V. to fasten with skewers; to pierce, as with a skewer. SKEW'ERING, imp. SKEW'ERED, pp. *-ėrd*.

SKI: a wooden snow-shoe, or runner of wood, from five to ten feet long, an inch or more thick at the middle, but thinner toward the ends, and curved up in a curve at the front. The ski is popularly worn in Norway and other northern countries. The fastening of the ski to

the feet is very simple, consisting of a loop of leather for the toe and a band which passes from this around the heel of the shoe, thus making the ski and the foot as firm as possible, which is necessary in order to steer well, while full freedom is allowed the heel to rise from the ski at every movement. When first putting on the ski a balancing stick is necessary, and, indeed, it will be found indispensable for some time; the most skilful runners need but a small stick. An ordinary ski runner is expected to maintain a gait of 8 or 9 m. an hour for quite a length of time. The longest race on skis, the distance being nearly 140 m., was run in less than 22 hours, rests included. A race in Christiania won by a peasant in less than 5 hours covered 32 m., laid out over hilly ground, including all kinds of difficulties calculated to test the competitors' skill. The annual tournaments held in the principal cities of Sweden and Norway are the great sporting events of the year, and when the noted jumpers are to run the king is sure to attend, the great feature of the sport being the ability to take long flying leaps. There have been a number of ski tournaments in Minnesota, and the number of runners in the United States has increased to an extent that has warranted the organization of a national association. The ski is in popular use in the Rocky Mountains and in Canada.

SKIAGRAPH, n. *skī'ă-grăf* [Gr. *skia,* shadow, + *graphō,* write]: a permanent shadow-picture, produced by Roentgen rays (q.v.) passing through the object and falling on a sensitive photographic film. Numerous other names have been given to the picture thus produced, as 'radiograph,' 'skotograph,' 'cathode photograph,' etc.

SKI'ASCOPE: the name of apparatus for making observations of the influence of the Roentgen rays on a fluorescent screen. The best form of the skiascope consists of a tapering light-tight box, provided at the narrow end with a closely-fitting open cap of black velvet or other soft dark-colored material into which the face will fit closely and exclude light, and at the other end is fixed the fluorescent screen. On looking through the instrument toward an excited Crookes tube placed near it the screen exhibits fluorescence where the Roentgen rays are not interfered with by objects sufficiently dense to obstruct their passage. When objects that are opaque to the Roentgen rays, such as glass, bones, and most of the metals, are intervened a shadow of them appears on the screen. Thus if the human hand is placed between the tube and the screen the Roentgen rays will penetrate the flesh but be obstructed by the bones, producing a shadow picture of the bones of the hand.

SKID, n. *skĭd* [Icel. *skid,* a billet of wood: Ger. *scheit,* a splinter]: piece of wood to facilitate and control the sliding of heavy weights; a piece of timber placed or hung against a ship's side to preserve it from injury by the rubbing of heavy rough bodies against it; any timber

used as a base to keep one object from resting on another; a sliding-wedge or a chain to stop the wheel of a carriage or wagon turning, in descending a steep; a drag: V. to check with a skid. SKID'DING, imp. SKID'DED, pp.

SKIDDAW, *skĭd'aw:* mountain in Cumberland, England, near the center of the county; height 3,054 ft. A few m. s. are Derwent Water and the town of Keswick.

SKIFF, n. *skĭf* [F. *esquif;* Ger. *schiff;* L. *scapha;* Gr. *skaphē,* a boat (see SHIP)]: a small light boat: V. to pass over in a light boat. SKIF'FING, imp. SKIFFED, pp. *skĭft.*

SKIFF, FREDERICK JAMES VOLNEY: American exposition-manager: b. Chicopee, Mass., 1851, Nov. 5. He engaged in newspaper work in the west, and during 1885-6 was a member of the Colorado legislature. In 1889 he was appointed commissioner of immigration and statistics for Colorado, and prepared the exhibits of the resources of that state for the Chicago and St. Louis Expositions 1889-90. In 1890 President Harrison appointed him one of the national commissioners to the World's Columbian Exposition. Subsequently he exchanged this post for that of chief of the department of Mines and Mining and later became deputy director-general. At the close of the Chicago Fair he became director of the Field Columbian Museum, Chicago. He assisted in organizing the Nashville Exposition in 1897 and was a member of the jury of awards; was director-in-chief of the United States exhibits at the Paris Exposition, 1898-1900; and on Sep. 15, 1901, was appointed director of exhibits of the Louisiana Purchase Exposition.

SKILL, n. *skĭl* [Icel. *skil,* separation, distinction: Dan. *skiel,* a separation; *skille,* to sever, to put asunder: Gael. *sgiol,* to separate: AS. *sculan,* to distinguish]: great readiness and ability in the practical application of any art, science, or handicraft; knowledge derived from practice; art; dexterity; in *OE.,* reason; cause. SKILLED, a. *skĭld,* having great readiness and ability; expert; knowing; dexterous. SKILFUL, a. *skĭl'fûl,* well versed in any art, science, or handicraft; able in management; expert; discriminating. SKIL'FULLY, ad. *-lĭ.* SKIL'FULNESS, n. *-nĕs,* the quality of possessing skill; ability derived from experience. SKIL'LESS, a. in *OE.,* wanting skill; artless.—SYN. of 'skill': ability; capacity; capability; genius; talent; cleverness; dexterity; adroitness; expertness; art; aptitude; knowledge;—of 'skilful': adroit; clever; skilled; dexterous; adept; masterly; knowing; able.

SKILLET, n. *skĭl'lĕt* [OF. *escuellette,* a little dish; *escuelle,* a dish—from L. *scutel'la,* dim. of *scutra,* a dish, a tray]: small metal vessel with a long handle, used for heating water.

SKIM, v. *skĭm* [a form of SCUM, which see]: to take off the scum, thence to move lightly over the surface

of a liquid; to clear of scum or floating matter; to pass very near the surface; to glide along; to pass lightly; to glide smoothly; to read superficially, as a book. SKIM'MING, imp.: N. the act of taking off that which floats upon a liquid: PLU. that which is removed from the surface of a liquid by skimming. SKIMMED, pp. *skĭmd.* SKIMMER, n. *skĭm'mėr*, one who or that which skims; a scoop used for skimming liquors. SKIM'MINGLY, ad. *-lĭ.* SKIMMED MILK, or SKIM-MILK, milk from which the cream has been taken.

SKIMBLE-SCAMBLE, a. *skĭm'bl-skăm'bl* [imitative and reduplicated words]: in *OE.*, wandering; wild; worthless.

SKIMMER, *skĭm'mėr:* sea-bird of a number of species, named from their flight near the surface of the sea when pursuing their aquatic prey, and belonging to the family of gulls and terns, *Laridæ.* The shape of their bill is very remarkable. The Black Skimmer (*Rhynchops nigra*) is the American species, rare n. as far as New Brunswick, more common from N. J. s. to Rio Janeiro, and reported on the w. coast. It has been called also the Razor-billed Shearwater, and Scissors-bill. The lower mandible is very long (4-4½ in.) and compressed, as knife-like below as are the upper edges, which fit into a groove in the comparatively short upper mandible; this is compressed, and moves on an elastic joint in the forehead. The plumage is black, with forehead, cheeks, under-parts, tips or secondaries, and lateral tail feathers white—sometimes tinged with roseate. The young are gray, brown, and white. The nest is a hollow in the sand of the coast, where the birds rest by day, taking their swift, graceful flight after prey at night. The eggs, $1\frac{3}{4} \times 1\frac{3}{8}$ in., white, black-blotched, are often gathered for food.

SKIMMINGTON, n. *skĭm'mĭng-tŏn,* or SKIM'MERTON, n. *-mėr-tŏn:* in *OE.*, a burlesque procession in ridicule of a man who suffered himself to be beaten by his wife.

SKIN, n. *skĭn* [Dan. *skind;* W. *cen,* skin: Icel. *skinn,* skin, fur: Ger. *schinden,* to skin]: external and natural covering of an animal's body (see below); hide; body; person; bark of a plant; husk or rind of fruits or seeds: V. to strip the hide or covering from; to flay; to cover with skin; to acquire a skin; to cover superficially. SKINS, n. plu. *skĭnz,* the pelts of small animals, as of sheep, goats, or seals. SKIN'NING, imp. SKINNED, pp. *skĭnd:* ADJ. covered with a skin. SKINNER, n. *skĭn'nėr,* one who deals in skins. SKIN-DEEP, superficial; slight. SKIN'LESS, a. *-lĕs,* having no skin. SKIN'FLINT, a very niggardly person. SKIN-WOOL, n. wool plucked from the dead sheep. SKIN'FUL, n. *-fûl,* all that the stomach can hold. SKIN-MOTH, or SKIN-EATER, popular name of different genera of the family of coleopterous insects *Dermestidæ,* whose larvæ prey on furs and skins, also on zoological specimens in museums, hence the name given

to one species of *Dermestes, Anthrenus museorum.* Benzine destroys them. In preparing the skins of animals for museums, arsenic is employed as a means of warding off the attacks of these insects. SKIN'NY, a. *-nĭ,* extremely thin; emaciated. SKIN'NINESS, n. *-nĭ-nĕs,* the quality of being skinny. ESCAPE WITH THE SKIN OF THE TEETH, to escape with life only.

SKIN: outer investment of an animal's body. Considered in its general physiological and histological (or textural) relations, the skin is merely a part of the great mucous system to which the mucous membrane and secreting glands also belong, and which consists of two essential elements—a *basement tissue,* composed of simple cutaneous membrane, and an *epithelium* of nucleated particles resting on it—while beneath the basement membrane are vessels, nerves and connective tissue. See EPITHELIUM: MUCOUS MEMBRANES: SKELETON. In the skin, the hard, nonvascular outer layer is termed *cuticle* or *epidermis,* and the true skin below it is termed the *derma* or *cutis vera,* and is formed chiefly of modified and very dense connective (or areolar or cellular) tissue.

The external surface of the skin formed by the cuticle is marked by furrows of different kinds. Some (furrows of motion) occur transversely in the neighborhood of joints, on the side of flexion; others correspond to the insertion of cutaneous muscles; while others, of quite another kind, are seen in aged and emaciated persons, and after the subsidence of any great distention of the integument; and besides these coarse lines, most parts of the skin are grooved with very minute furrows, which assume various courses in relation to one another. These minute furrows are most distinctly seen on the palmar aspect of the hand and fingers, and on the sole of the foot. Probably in no two individuals are these furrows identical: hence the imprint of the palmar surface of the thumb is regarded as an infallible means of personal identification, and is used by police authorities as part of a system of 'criminal anthropometry.' The outer surface of the skin presents also innumerable pores for discharge of the contents of the sweat and fat glands; and the modifications of epidermis known as hair and nails occur on the same surface. The epidermis is made up of several layers: the outer, horny layer, made up of layers of hard flat cells; the *stratum lucidum,* consisting of transparent cells; the granular layer, made up of flat granular cells; and the mucous layer, or *sete mucosum,* formed of columnar-shaped cells containing more or less pigment according to the color of the skin.

The deep layer of the skin consists of connective tissue, in which both the white and yellow fibrous elements are considerably modified as to the proportions in which they occur, and smooth muscles are present in considerable quantity in some parts of the skin. Where great extensibility, with elasticity, is required, the yellow (elastic) element predominates; where strength and resistance

are specially required, as in the sole of the foot, the *cutis* is composed chiefly of a dense interweaving of the white (inelastic) element. The thickness and strength of this layer differ greatly in different parts, according to the amount of resistance required against pressure. The skin is thicker on the hinder surface of the body than in front, and on the outer than on the inner sides of the limbs. It is unusually thin over the flexures of the joints. It is particularly delicate in the eyelids, and proportionately so in some other situations where great mobility is demanded. In regions most subject to external pressure, as the soles of the feet, it is firmly united by very dense laminæ to the subcutaneous fascia; and the intervals between these are provided with pellets of fat, forming a cushion as additional protection to the delicate organs which it incloses and covers. Among the lower animals are numberless examples of analogous kind. The blubber of the whale merely represents, in very exaggerated form, the layer of fat which generally occurs in the subcutaneous areolar tissue of man and most animals, serving as a soft bed on which the skin may rest, and giving the appearance of plumpness and symmetry to the outline of the body. It is on the external surface of the cutis that the *tactile papillæ,* or true organs of touch, are developed. Kölliker divides the true cutis into the 'reticular' and 'papillary' portions, the latter being the reddish-gray external superficial layer which contains the upper portion of the hair follicles and cutaneous glands, and whose most important element is these tactile papillæ. They are most abundant and largest in the palm of the hand and the sole of the foot, while in the back and in the outer sides of the limbs, they are almost entirely absent. They occur as small, semi-transparent, flexible elevations (see *b,* fig. 1), which are usually conical or club-shaped in form; but in certain parts, as the palm of the hand, present numerous points, and are termed compound papillæ. In one square line of the palm of the hand there are 81 compound, and 150 to 200 smaller papillæ, arranged in nearly regular rows.

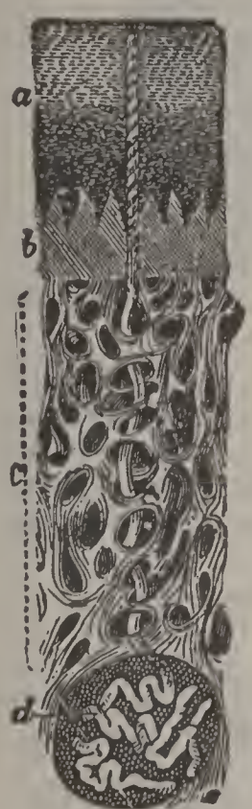


Fig. 1.—Vertical Section of the Skin of the Sole.
a, Cuticle; *b,* Papillary structure; *c, Cutis vera,* or true skin; *d,* Sweat-gland lying in a cavity on the deep surface of the skin, and imbedded in globules of fat. Its duct is seen passing to the surface. Magnified about 30 diameters.

The thickness of the true skin varies, according to Kölliker, from one-eighth of a line to a line and a half. In its chemical characters, it agrees with those of the

connective tissue, of which principally it is composed. The gelatine which it yields on boiling is derived mainly from the white fibrous tissue, and probably this element is principally concerned in the changes which skin undergoes in the process of tanning. Arteries from the subcutaneous connective tissue freely enter into the struc-

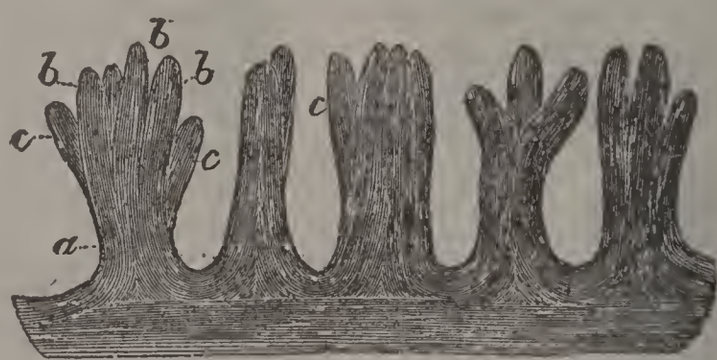


Fig. 2.—Compound Papillæ of the Surface of the Hand, with Two, Three, and Four Points:
a, Base of a papilla; *b*, *b*, their separate processes; *c*, *c*, Processes of papilla when base is not visible. Magnified 60 diameters.

ture of the skin, and are distributed to the fat-lobules, the sudoriparous and sebaceous glands (described below), the hair follicles, the papillæ, etc. In these several parts, they terminate in a close network of capillaries. The two accompanying diagrams illustrate the

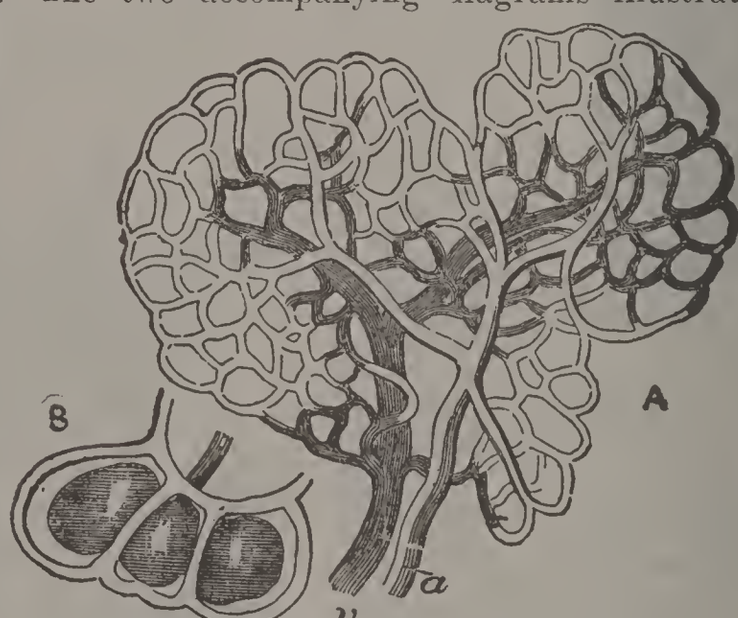


Fig. 3.—Blood-vessels of Fat:

A, Minute flattened fat lobule, in which the vessels only are represented; *a*, Terminal artery; *v*, Primitive vein. Magnified 100 diameters. B, Plan of arrangement of the capillaries on the exterior of the vesicles, more highly magnified.

mode in which these capillaries are distributed over the fat-cells and in the papillæ. Those parts of the skin which border on the epidermis are mostly very freely provided with nerves, while in the deeper parts the nervous filaments are comparatively scanty. The nerves

of the skin are branches both of the spinal and of certain cranial nerves. As these nerves pass toward the papillæ they unite to form a nerve plexus, from which smaller branches go out to enter the papillæ; there, especially in the skin of the palm of the hand and sole

Fig. 4.—Arrangement of the Capillary Loops in the Skin.

(the portions of the body most sensitive to touch-impressions), they terminate in the *touch-corpuscles,* discovered by Wagner and Meissner. These are either single or compound, and usually are ovoid in form: to each single corpuscle and to each division of a compound one is distributed a medullated nerve fibre.

The glands in the skin next claim consideration. They are the *sudoriparous* or *sweat-glands,* the *sebaceous* or *fat glands,* and the *ceruminous glands.* The *sweat-glands* exist in almost every part of the human skin; they lie in small pits in the deepest parts of the true skin, and sometimes entirely below the skin. Their orifices can be seen in the middle of the cross-grooves that intersect the ridges of the papillæ on the hands and feet, their arrangement being here necessarily regular, while in other parts they are irregularly scattered. Their size and number in different regions of the skin correspond with the amount of perspiration yielded by each part; thus, they are nowhere so much developed as in the axilla, or armpit. In that part of this region, which in the adult is more or less covered with hair, they form a layer of reddish color, about an eighth of an inch thick. They are soft, and more or less flattened by their pressure on one another, being imbedded in delicate connective tissue, and covered and permeated with a network of capillaries. On isolating one of these glands, and highly magnifying it, it is found to consist of a solitary tube, intricately convoluted, one end of

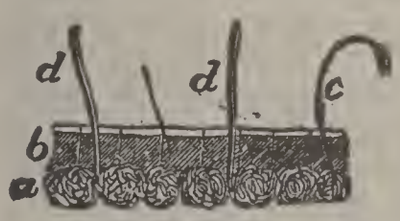


Fig. 5.—Vertical section of the Skin and Sweat-glands of the Axilla.
a, Layer of glands with their ducts traversing *b,* the cutis and cuticle; *c,* A small hair; *d, d,* Portions of larger hairs. Magnified one and a half diameters.

which is closed, and hidden within the glandular mass, while the other emerges from the gland. The wall of the tube consists of an outer or *basement membrane,* with which the blood-vessels are in contact; and an *epithelium,*

Fig. 6.—A Sweat-gland and the Beginning of Its Duct:

a, Venous radicles on the wall of the gland; *b,* Capillaries. The vessels are all outside. Magnified 35 diameters.

lining the interior; the former disappearing where the tube reaches the surface of the papillæ. The duct, on leaving the gland, follows a spiral direction through the reticular portion of the cutis to the interval between the papillæ, when it becomes straight; and it again assumes a spiral course in perforating the cuticle (see fig. 1). It is not easy to explain how or why so beautifully regular a spiral form should be given to the cuticular portion of the duct, which is rather wider than the rest, the average diameter of the duct being 1/1700 of an inch.

The *sebaceous glands* are small, whitish glands, which exist in almost every part of the skin, except the palms and soles, and are abundant especially in the scalp, face (the nose particularly being rich in them), and about the anus. They are usually connected with the hairs, as shown in fig. 7, and consist of a duct terminating in a blind pouch-like or pear-shaped extremity. The *basement membrane* of these glands is lined by an epithelium, in whose particles are included granules of fatty or sebaceous matter, which, having become detached, constitutes the secretion. These glands are sometimes the seat of a parasite, *Acarus folliculorum.*

The *ceruminous glands* are brown simple glands, in external appearance like the sudoriparous glands, occurring in the cartilaginous portion of the external meatus of the ear. They yield an adhesive bitter secretion, which protects the membrane of the tympanum from access of dust, insects, etc.

It is an interesting fact that certain outgrowths not ordinarily regarded as skin are really transformations of cuticle, such as hair, horns (the skeleton core of certain horns excepted), and finger-nails—the latter formed by an infolding and thus duplication of the cuticle. Even

teeth belong to the skin (formed in its invaginations, like hairs), though set in sockets of the jaw; in many animals, chiefly fish, they are plainly transformations of skin, without sockets, and occur on any part of the mouth, e.g., the tongue (snails).

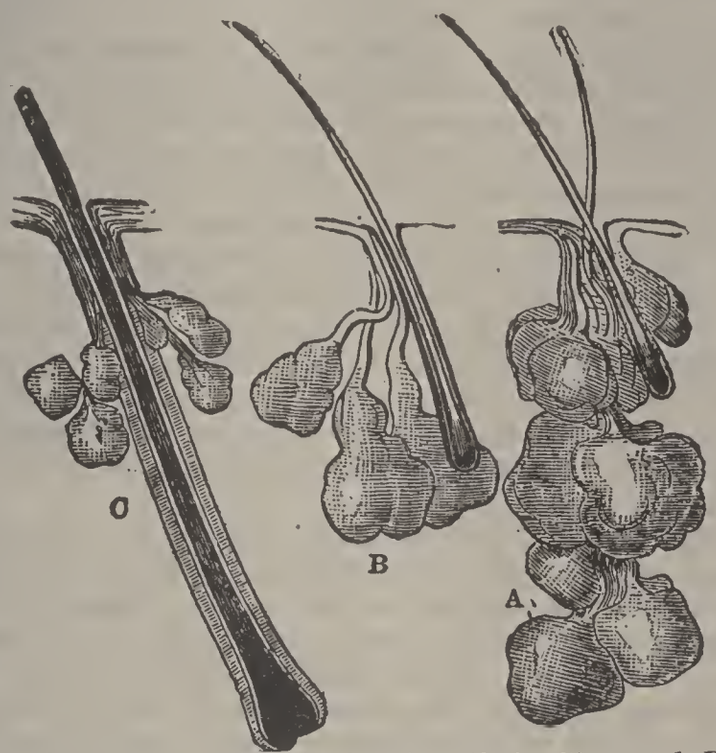


Fig. 7.—Sebaceous Glands, showing their Size and Relation to the Hair-follicles:

A and B, From the Nose; C, From the Beard. Magnified 18 diameters.
(With two exceptions, the diagrams in this article are borrowed from Todd and Bowman.)

We conclude with brief survey of the functions of the skin, omitting, however, its most important function, TOUCH (q.v.). Regarded as a protective covering, the skin possesses the combined advantages of toughness, resistance, flexibility, and elasticity; the connective framework being the part which mainly confers these properties, though the epidermis coöperates with it. The subcutaneous layer of fat, and the modifications of epidermis in various forms, e.g., hairs, wool, feathers, scales, etc., serve for preservation of warmth, and occasionally (when they occur as claws, talons, etc.) as means of offense or defense. The skin is the seat of a twofold excretion—viz., that formed by the sudoriparous glands, and that formed by the sebaceous glands. The fluid secreted by the sudoriparous glands is usually formed so gradually that it evaporates as soon as it reaches the surface; but in certain conditions, as during strong exercise, or when the external heat is excessive, or in certain diseases, or when the evaporation is prevented by application of a texture impermeable to air, the secretion collects on the skin in the form of drops of fluid. When

it is stated that the sweat contains urea, lactates, extractive matters, etc., and that the amount of watery vapor exhaled from the skin is, on an average, 2½ lbs. daily, the importance of the sudoriparous glands is manifest. Moreover, there is reason to believe that the importance of the skin as a *respiratory* organ is considerable, very appreciable quantities of carbonic acid being exhaled hourly by the external surface of the body.

The excretory function of the skin has a very important relation to that of the mucous membrane which lines all the open cavities of the body, and is really a continuation inward of the outer skin, so that a true view of the two is that in many respects they are one organ; hence, when, under some conditions, the outer skin is chilled and its pores closed, its work is thrown as an additional burden on the inner skin, or mucous lining, and congestion ensues, such as colds, pulmonary inflammation, bowel troubles, etc. A prime requisite to recovery, and to health in general, is to keep the skin clean and active.

The secretion of the sebaceous glands is a semi-fluid oily mass, which often solidifies into a white viscid tallow-like matter on the surface or in the glandular ducts, from which it can be removed by pressure, in a form resembling that of a small whitish worm or maggot. Under the microscope, are observed cells containing fat, free fat mixed with epidermic scales, and sometimes crystals of cholesterin. Its chemical constituents, in addition to water, are a peculiar nitrogenous matter resembling casein, fat (consisting of palmitin and olein, soaps composed of palmatic and oleic acids), cholesterin, earthy phosphates, and chlorides and phosphates of the alkalies. Its purpose seems to be that of keeping the skin moist and supple, and by its oily nature, of hindering too rapid evaporation.

The skin is, moreover, an organ of absorption: mercurial preparations, rubbed into the skin, have the same action as when given internally. Potassio-tartrate of antimony, rubbed into the skin in the form of ointment or solution, may excite vomiting, or an eruption extending over the whole body; and many similar illustrations might be given. The effect of rubbing is probably to force the particles of the matter into the orifices of the glands, where they are more easily absorbed than through the epidermis. It has been proved by experiments that the skin has the power of absorbing water, though to a less extent than in thin-skinned animals, such as frogs and lizards. This fact has a practical application. In severe cases of dysphagia—difficult swallowing—when not even fluids can be taken into the stomach, immersion in a bath of warm water, or of milk and water, may assuage the thirst. Sailors, also, when destitute of fresh water, find their urgent thirst somewhat allayed by soaking their clothes in salt water.

The *diseases* of the skin, and their classification into

genera and species, have occupied much attention; but none of the proposed classifications is satisfactory. For the more important affections, see special articles. See ECZEMA: ECTHYMA.

SKINCH, v. *skĭnch:* to stint, to scrimp; to give short allowance.

SKIN-GRAFTING: operation in plastic surgery, by which skin is transplanted to a denuded surface. The idea of skin-grafting appears to have occurred first to Dr. Frank H. Hamilton, of New York, who proposed to plant *in the centre* of an ulcer a piece of healthy skin; he suggested that the graft would grow out by proliferation of its cells from all its borders toward the natural skin around the ulcer. But the method of skin-grafting now in use was devised 1869 by Dr. J. L. Reverdin, surgeon in Paris. In this method the grafts are from the epidermis, taken from such portions of the bodily integument as are softest and most flexible, e.g., from the inside of the thigh flexure, or of the elbow, etc. Using all precaution against septicæmia, the surgeon takes a portion of epidermis, and, having cut it into pieces about the size of the head of a pin, first carefully smooths out the minute graft, and then applies it to the ulcerated surface at the distance of ¼ to ½ in. from the edge of the ulcer; then another and another at like distances, and so on. The grafts grow toward each other and toward the margin till the denuded surface is covered. Still another method of skin-grafting was invented by Thiersch, a German surgeon. It consists in the implantation of broad strips containing not only the epidermis, but also the sete mucosum and part of the cutis vera. The ingrafted skin may be taken from the subject under operation, or from another person. See RHINOPLASTIC OPERATION.

SKINK, n. *skĭngk* [AS. *scenc,* a drink: Icel. *skenkja;* Ger. *schenken,* to pour out, to serve with wine]: in *OE.,* drink; anything potable; pottage: V. to serve with drink. SKINK'ING, imp. SKINKED, pp. *skĭngkt.* SKINK'ER, n. one who serves drink.

SKINK, or SCINK, *skĭngk:* any species of family *Scincidæ,* a group of lizards with long, round neck, trunk, and tail, covered with mostly smooth scales in quincunx arrangement, the head with angular plates, and the sides of the body without folds. They are harmless, living in concealment, natives of the tropics and warm temperate zone, and feed on insects and worms. There is every gradation in the development of the legs, according to some authors, while other authorities make separate families of those with two members wanting or with none visible, such as the imperfect-limbed *Seps* and the limbless and still more snake-like *Anguis,* or 'slow-worms.'

The most common species in the prairie region of the Mississippi valley is the Five-lined Skink (*Euprepes quinquelineatus*), small, with five whitish lengthwise lines

on the olive-brown back; and the same species is reported 10 in. in length, toward the Gulf of Mexico. Another American species, if distinct, is the Blue-tailed Skink (*Eumeces fasciatus*); also the Ground Skink (*Oligosoma laterale*), not uncommon. The so-called Great Galliwasp (*Diploglossus occiduus*) of Jamaica is more than 20 in. long. A threefold subdivision of the family has been characterized by the eyes—those with two lids, those with rudimentary lids and those with concealed eyes.

The Skink or Adda of Arabia and Africa (*Scincus officinalis*) is 6 to 8 in. long, generally of reddish-dun color, with darker transverse bands, a wedge-shaped head, and four strong limbs. It has been in great repute for imaginary medicinal virtues from remote times; it was largely imported on this account into ancient Rome, and is still in high esteem in the east, dried skinks finding ready sale in many places, e.g., Cairo and Alexandria. There is almost no disease for which it has not been supposed to be a cure.

SKINNER, *skĭn'ėr*, THOMAS HARVEY, D.D., LL.D.: 1791, March 7—1871, Feb. 1; b. Harvey's Neck, N. C.: Presb. divine and author. After graduation at Princeton 1809, and studying law, he became a theol. student at Princeton. He was associate pastor with Dr. Janeway, Philadelphia, 1813-16, when he was called to the Fifth Presb. Church in Arch street in that city. After two years at Andover as prof. of sacred rhet., he became 1835 pastor of the Mercer Street Presb. Church, New York; and from 1848 until his decease was prof. of sacred rhet. and pastoral theol. in Union Theol. Seminary, New York. His reputation was wide as a logical sermonizer, effective preacher, successful teacher; and as author of valued books, among which were: *Aids to Preaching and Hearing* (1839); *Hints to Christians* (1841); *Vinet's Pastoral Theology* and *Homiletics* (1854); *Discussions in Theology* (1868); and *Thoughts on Evangelizing the World* (1870).—His son, THOMAS HARVEY SKINNER, D.D., was pastor of the Carmine Street Presb. Church, New York, and of a Reformed (Dutch) church on Staten Island, and of the Furth Street Presb. Church, Cincinnati; professor in the Allegheny Presbyterian Theological Seminary; and professor of theology in the McCormick Theological Seminary, Chicago.

SKINNER, WILLIAM: American manufacturer: b. London, England, 1824; d. Holyoke, Mass., 1902, Feb. 28. He came to the United States in 1845 and settled in Northampton, Mass., where he engaged in the silk business. He became a partner in a silk manufacturing firm in 1848 and in 1851 established a business of his own at Williamsburg, Mass. His factories being destroyed by the Mill River flood in 1874, he rebuilt them in the same year at Holyoke. He was actively engaged in philanthropic work, was a generous benefactor of Vassar, Smith, and Holyoke colleges, built a gymnasium for Dwight L. Moody's school in Northfield, Mass., was

president of the local city hospital and also of the Manufacturers' Association of Holyoke.

SKINNERS: bands of marauders, adherents to the American cause who infested what was considered neutral ground along the Hudson river in New York state, during the American War of the Revolution. The Skinners carried on a vigorous guerrilla warfare, being opposed by the Cow-boys, as the maurauding adherents to the British cause were called. In some instances the Skinners did serviceable work for the American army, harassing small detachments of British soldiery, scouting and foraging parties, and acting as scouts for the Americans when occasion demanded. It was a party of three Skinners who intercepted André on his way back to New York, after receiving treasonous papers from Benedict Arnold at West Point. This was the chief service performed by the Skinners, who, like the Cowboys, operated principally in Westchester county and were not particularly scrupulous as to the party to which their victims belonged.

SKIN SENSATION: all the various psychical effects that external objects or stimuli may produce upon the human skin are called cutaneous sensations. These have been divided into several classes, differing with different authors, but all agree pretty well in giving pressure, touch, pain, pleasure, tickling, itching, and temperature (heat and cold) sensations. Pressure and touch may be one and the same sensation quality with differences only in intensity. So also tickle and itching may belong to the same kind of sensation and differ from one another only in quality. They may both be modes of pressure. Pressure sense as well as temperance sense is not distributed uniformly over all parts of the skin. There are pressure spots, heat spots and cold spots irregularly distributed over most dermal regions. These spots are sensitive or respond only to their appropriate stimuli. The heat and cold spots are easily demonstrated by passing the point of a brass rod, heated to about 100° F. or cooled to about 50° F. over the skin of the back of the hand. Generally the hot or the cold rods will give only sensations of touch free from temperature quality, but now and then they will strike points that yield clear and unmistakable sensations of heat or cold. Such places as give sensations of heat are called hot spots and such as give sensations of cold are called cold spots. The cold spots usually respond much more vigorously than the heat spots. Pressure spots are much less easily demonstrable and some authors doubt their existence altogether. General pressure sense aids much in discriminating the weights of objects. The amount of pressure upon any given area of the skin that will just produce a sensation is called the threshold of sensation. This differs for different areas, depending upon the thickness of the skin, the presence of hairs, etc. The

amount of difference between two weights than can be just discriminated is called the threshold of discrimination. This is fairly constant for all areas of the skin and for all weights of moderate heft, i.e., from about 2 oz. to 2 lbs. perhaps. It depends somewhat upon the area of the contact surface on which the weight is rested, but on the average it is about one-third.

Pain may be proved not to be uniformly felt in all areas by pricking the skin on the hand's back with a cambric needle. It will not be felt equally sharp or painful in all places. Pleasure is more general and less distinctly localizable. Tickling and itching seem to be complex mental states that have been developed in ancestral history in the struggles which mankind has waged with insect pests. Tickle sense is found better developed around the openings to the body. The mouth, nose, eyes and ears respond with exceptional vigor. Tickle sensations invite almost irresistible tendencies to rub the area tickled. This rubbing seems to be necessary to allay the sensation which will, if not arrested, sometimes pass into an irritation and annoyance that makes one shudder to think of. In the respect of retouching, itching is like tickling. The stimulus to itching is found in dust particles, in the stings and bites of insects and in the poisonous properties of many plants. Itching is generally followed by local inflammations. The rationale of this tendency to retouch and rub, and it is present in general touch, is for the sake of defense, the removal of the offending object.

SKIP, v. *skĭp* [W. *cip,* a sudden snatch or effort: Gael. *sgiab,* to start or move suddenly: Icel. *skoppa,* to spin round]: to leap lightly; to spring or bound as a goat; to pass over; to omit: N. a light leap; a bound; in *sugar-making in W. I.,* a charge or strike of syrup from the coppers. SKIP'PING, imp.: ADJ. leaping lightly; bounding. SKIP'PINGLY, ad. *-lĭ.* SKIPPED, pp. *skĭpt.* SKIP'PER, n. one who skips; the cheese-maggot; name sometimes given to the saury pike, *Scomberesox saurus.* TO SKIP OVER, to pass without notice; to omit. SKIP-JACK, an upstart; a lackey. SKIPPING-ROPE, a cord, generally mounted with handles, used by children in skipping in play.

SKIP, n. *skĭp* [see SKIP 1]: in the Scotch game of *curling,* the last of his party or side who plays; the captain or leader of his team: V. to hurl the stone along the ice; to make a thin stone skim along the surface of water. SKIP'PING, imp. SKIPPED, pp. *skĭpt.*

SKIP: basket, box, etc. See SKEP.

SKIPPER, n. *skĭp'pĕr* [Dut. *schipper,* a sailor—from *schip,* a ship (see SHIP)]: the master of a trading or merchant vessel.

SKIPPER: a butterfly of the family *Hesperidæ.* The body is short and thick, head large, eyes prominent, antennæ short, with the knob curved like a hook or bent

to one side, legs, six, and the four hindmost shanks armed with two pairs of spurs. Skippers are generally rich brown, marked with yellow spots. The species are quite numerous, and expand from 1½ to 2½ in. They owe their name to their jerky flight.

SKIPPET, n. *skĭp'ĕt:* in *archeol.,* a small cylindrical turned box, with a lid or cover, for keeping records.

SKIRMISH, n. *skėr'mĭsh* [OF. *escarmouche;* Ger. *scharmützel;* It. *scaramuccia,* a skirmish: OHG. *scirman,* to defend, to fight]: an encounter of a few men when they fight in confusion; a slight combat between detachments and small parties from the main armies: V. to fight slightly or loosely in small or detached parties. SKIR'MISHING, imp.: N. the act of fighting lightly in small parties: ADJ. fighting in a loose desultory manner, as *skirmishing* parties. SKIR'MISHED, pp. *-mĭsht.* SKIR'MISHER, n. *-mĭsh-ėr,* one who skirmishes.—Skirmishers operate in loose array, two together—i.e., front and rear, with a lateral distance of about six paces between the files. When the army advances, the ground in front and for some distance on each flank is usually covered by skirmishers, to prevent surprise. If cavalry come suddenly on them, they rush together, and form small squares, called rallying squares. Skirmishers fire independently at their own discretion; but the rule is, that one of the two men composing a file should always have his rifle loaded. Orders are communicated by sound of bugle. Each company of skirmishers has a reserve force to fill the places of men who drop out, and to supply ammunition, etc.

SKIRR, v. *skėr* [Low Ger. *schurren,* said of a thing that makes a noise by rubbing along the ground; *schirren,* expressing a clearer noise: Ger. *scharren,* to scrape with the feet]: in *prov. Eng.* and *OE.,* to glide or move quickly; to graze, skim, or touch; to scour; to run in haste. SKIR'RING, imp. SKIRRED, pp. *skėrd.*

SKIRRET, n. *skĕr'rĕt* [said to be a corruption of *sugar-wort* or *sugar-root*], (*Sium Sisarum*): perennial plant of nat. order *Umbelliferæ,* native of China and Japan, but long cultivated as the Water-parsnip in gardens of Europe for its roots, which are tuberous and clustered, sometimes 6 in. long, and of the thickness of the finger. They are sweet, succulent, and nutritious, with a somewhat aromatic flavor, and when boiled are agreeable as food. A kind of spirituous liquor is sometimes made from them; good sugar also can be extracted. Skirret is less cultivated than formerly. It is propagated either by seed or by very small offsets from the roots. It has a stem 2-3 ft. high; the lower leaves pinnate, with oblong serrated leaflets, and a heart-shaped terminal leaf, the upper ones ternate, with lanceolate leaflets.

SKIRT, n. *skėrt* [Icel. *skyrta,* a shirt: Dan. *skiört;* Sw. *skorte,* a skirt: a doublet of SHIRT, which see]: the loose

part of a coat or garment below the waist; the edge of any part of a dress; the lower portion of a dress; an upper petticoat; border; margin; among *butchers,* the midriff: V. to border; to form the border or edge of; to be on the border; to go along the edge of; to live near the extremity. SKIRT'ING, imp.: N. material for women's skirts; in *arch.,* the narrow upright boarding placed round the margin of a floor; called also wash-board, mop-board, base-board; and, when large, base-plinth. SKIRT'ED, pp.

SKITTISH, a. *skĭt'tĭsh* [see SHOOT: Sw. *skutta,* to leap]: humorsome; frisking; wanton; volatile; shy; easily frightened; fickle; changeable. SKIT'TISHLY, ad. *-lĭ.* SKIT'TISHNESS, n. *-nĕs,* the state of being skittish; wantonness. SKIT, n. *skĭt,* a squib; a lampoon; in *OE.,* a light wanton wench: V. in *prov. Eng.,* to asperse.

SKITTLES, n. plu. *skit-tlz* [the same word as SHUTTLE, which see: Dan. *skyttel;* Sw. *sköttel,* a shuttle]: game played in England since the 14th century, with 9 wooden pins (skittles), which the players knock over with a roundish ball. It is played usually in a covered shed, called a skittle-alley, about 60 ft. in length. The skittles are of hard wood, and are placed on the floor in the shape of a diamond. The player throws a wooden missile, shaped like a small cheese, and tries to knock down the whole of the skittles in a given number of throws. The rules of the game vary in different places. The game of ten-pins (or of nine-pins) does not differ essentially from skittles: it is played with 10 (or 9) pins arranged in the form of a triangle; and the missile, a wooden ball, is rolled along a carefully constructed wooden floor. SKITTLE-BALL, a ball for throwing at skittles. SKITTLE-ALLEY, a place where the game of skittles is played.

SKIVERS, n. plu. *skī'vĕrz* [Dut. *schiif,* a shive or slice: Dan. *skive,* a thin slice: Icel. *skifa,* to split (see SHIVER)]: split sheep-skins tanned in sumach and dyed, used for bookbinding, etc.

SKOBELEFF, *sko'bē-lĕf,* MIKHAIL DIMITRIEVICH: Russian general: 1843-1882, July; b. Riazan; son of a general. He left the milit. acad. 1868, with rank of major; was attached to the Grand Duke Michel in the Caucasus 1871; commanded the advance corps d'armée 1873, seizing Khiva; vanquished the Khokands 1875, and the Kara-Kirghis 1876; and was promoted major-general, and governor of the provinces annexed. His brilliant qualities shone in the Turko-Russian war 1877-8, particularly at Plevna and in the Shipka passage, and later in taking Géok-Tépé in the Turcoman campaign, opening the way to Merv. His success was less on a diplomatic mission afterward to Germany. He died suddenly at Moscow.

SKORODITE, n. *skŏr'ō-dīt* [Gr. *skorodon,* garlic]: a hydrous arseniate of iron of a leek-green color, inclining to brown.

SKOWHEGAN, *skow-hē'gan:* town, county-seat of Somerset co., Maine; on the Kennebec river, and on the Maine Central railroad, 45 m. w. of Bangor. The first settlement in this vicinity was made in 1792; Skowhegan was at first a part of the town of Canaan, but was separately incorporated in 1823 under the name of Milburn; in 1836 it was given its present name, which is the ancient Indian name for the place. The town of Bloomfield was annexed in 1861. The Kennebec here has a perpendicular fall of 30 ft., and this furnishes excellent waterpower. The census of 1900 reported 69 manufacturing establishments in the town, with a capital of $941,681; they include lumber, pulp, flour, and woolen mills, shoe factories, and manufactories of scythes, axes, etc., and oil-cloth. There are two national banks with a combined capital of $275,000. The town has a high school, and a public library (founded 1867). Pop. (1900) 5,180; (1910) 5,341.

SKRAELINGS, n. plu. *skrā'lĭngz* [Icel., dwarfs]: a name given by the old Norsemen to the Esquimaux.

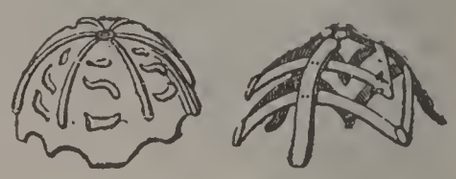
SKREEN, *skrēn:* another spelling of SCREEN, which see.

SKUA, *skū'a,* or SKU'A GULL (*Lestris*): genus of birds of family *Laridæ,* known also by the name JÄGER [Ger., hunter]: differing from the gulls in having the upper mandible more hooked at the tip, and the nostrils larger and further forward in the bill, the base of which is covered with a cere. The skuas are bold and powerful birds, and generally obtain their food by pursuing gulls or terns, and causing them to disgorge the fish which they have captured which they dart upon and seize in the air. They eat also eggs and small birds. The COMMON SKUA (*L. cataractes*) is fully 2 ft. in length, of brown color, with lighter streaks on the head and neck. It inhabits the northern seas of Europe, and has been found on the coast of California, a species like it occurring also in the Antarctic regions. The Arctic species (*L. parasiticus*) is smaller, 21 in. long, the central tail feathers projecting; it is found also in n. Europe, and visits the New England coast, and in winter the Gulf of Mexico.

SKULDUDDERY, *skŭl-dŭd-ėr-ĭ,* or SCULDUD'RY, or SKULDUGGERY, n. *-dŭg'ĕr-ĭ* [Scotch]: obscenity; grossness of conduct or of speech.—In Mo., the term is applied to underhand plotting (Bartlett, *Dic. Americanisms*).

SKULK, v. *skŭlk* [Dan. *skulke,* to slink, to sneak: Dan. *skiul;* Icel. *skjol,* shelter: Low Ger. *schulen,* to conceal one's self, as from shame or fear: Gael. *sgiolg,* to creep or slip in and out]: to get out of the way in a slinking, sneaking manner; to avoid work or duty in a cowardly manner; to lurk: N., also SKULK'ER, n. *-ėr,* one who skulks; one who avoids or shirks duty. SKULK'ING, imp. SKULKED, pp. *skŭlkt.* SKULK'INGLY, ad. *-lĭ.*

SKULL, n. *skŭl* [Dan. *skaal*, a cup or bowl: Icel. *skal*, a bowl: Sw. *skull* or *skoll;* OE. *schal*, a bowl or drinking-cup: Gael. *sgail*, a covering]: natural bony or cartilaginous covering of the brain, including the head, and supporting the face: head. SKULL-CAP, close cap to fit the upper part of the head; also, *formerly*, an iron defense for the head, within the cap.—The *Skull* as the framework of the head may be considered in two sections, the cranium and the face. In human anatomy, it is customary to describe the former as consisting of 8, and the latter of 14 bones; the 8 cranial bones, which constitute the brain-case, being the *occipital, two parietal, frontal, two temporal, sphenoid*, and *ethmoid;* while the 14 facial bones are the *two nasal, two superior maxillary, two lachrymal, two malar, two palate, two inferior turbinated, vomer*, and *inferior maxillary*. The bones of the ear, the teeth, and the



Iron Skull-caps.

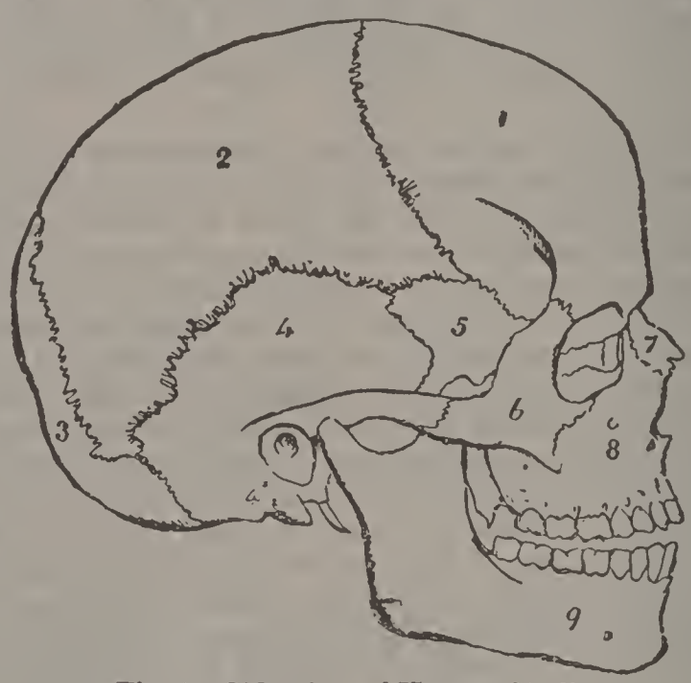


Fig. 1.—Side-view of Human Skull:

1, Frontal bone; 2, Parietal bone; 3, Occipital bone; 4, Temporal bone (squamous portion); 4* Do. (mastoid portion); 5, Sphenoid bone; 6, Malar bone; 7, Nasal bone; 8, Superior maxillary or jaw bone; 9, Inferior maxillary or jaw bone.

Wormian bones are not included in this enumeration. The morphologist, however; tracing the fundamental similarity of type in the various modifications of the vertebrate S., is not content with this arrangement, in which—e.g. in the occipital, temporal, and sphenoid bones—the human anatomist considers as a single bone an osseous mass consisting primarily in man, and persistently in some lower vertebrates, of several distinct pieces or elements. Postponing to the close of this article any remarks on the structure of the vertebrate S. generally, we notice the ordinary anatomical relations of the human skull. At a very early period of

fetal existence, the cerebrum is inclosed in a membranous capsule external to the dura-mater, and in close contact with it. This is the first rudiment of the S., the cerebral portion of which is consequently formed before there is any indication of a facial part. Soon, however, four or five processes jut from it on either side of the mesial line, which grow downward, incline toward each other, and unite to form a series of inverted arches, from which the face is ultimately developed. Imperfect development or ossification of these rudimentary parts of the face gives rise to the peculiarities known as 'hare-lip' and 'cleft-palate;' or in extreme cases to the form of monstrosity termed 'Cyclopean,' in which, from absence of the frontal processes, the two orbits form a single cavity, and the eyes are more or less blended in the mesial line.

The events in the ordinary or normal development of the S. are as follows: Cartilage is formed at the base of the membranous capsule, above described as thrown round the brain and capable of enlarging with it. This is speedily followed by deposition of ossific matter at various points of the capsule, which soon becomes converted into flakes of bone affording protection for the brain, while the intervening portions, which remain membranous, per-

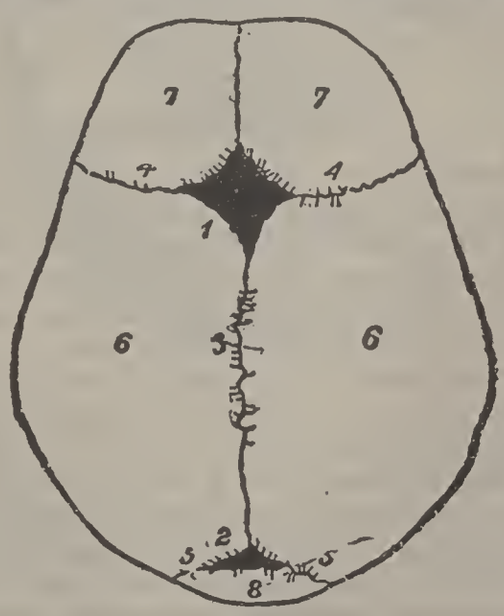


Fig. 2:

1, Anterior fontanelle; 2, Posterior fontanelle; 3, Sagittal suture 4, 4, Coronal suture; 5, Lambdoidal suture; 6, 6, Parietal bones 7, 7, Two halves of the frontal bone, still ununited; 8, Occipita bone.

mit the S. to expand as its contents enlarge. The formation of these bony flakes on the convexity of the cranium is soon followed by the appearance of osseous nuclei in the cartilage at the base, corresponding to the future occipital and sphenoid bones. Lastly, the various bones, some originating in membrane, some in cartilage (see OSSIFICATION), approach one another by gradual enlargement, and become united in various ways to form a continuous and ultimately unyielding bony case, admirably adapted for

defense of the brain, for accommodation of the organs of special sense, and for attachment of the ligaments and muscles by which the S. is supported and moved on the spine. At the period of birth, most of the principal bones have grown into apposition with their neighbors, forming the *Sutures* (q.v.); but one large vacuity remains at the meeting-point of the parietal and frontal bones, which is termed the anterior fontanelle, which does not close till the second year after birth, and sometimes remains open much longer. The fontanelle is so called from the pulsa-

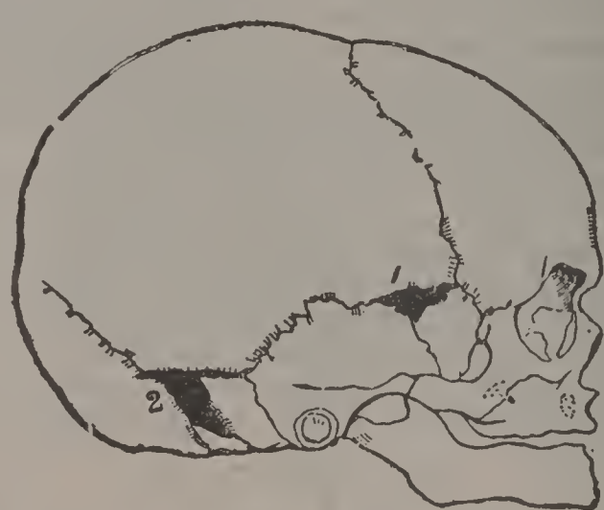


Fig. 3:
1, 2, Lateral fontanelles.

tions of the brain, which may be here seen resembling the rising of water at a spring or fountain. There are two fontanelles in the mesial line (fig. 2), and two lateral fontanelles on either side (fig. 3). The sutures remain distinct long after the closure of the fontanelles, and probably serve both in permitting increase of size of the cranium by growth of the bones at their edges, and in diminishing and dispersing vibrations from blows, and thus contributing to the security of the brain.

After the sutures have been formed, and the S. has acquired a certain thickness, a process of resorption begins in the interior of the bones, and reduces the originally dense structure to a more or less cellular or cancellated state. The interior thus altered is called the *Diplöe*, and by this change the weight of the S. is much diminished, while its strength is scarcely affected.

The diplöe usually begins to be apparent about the 10th year, and is most developed in those skulls which are thickest. Dr. Humphry, author of *The Human Skeleton*, observed it to be especially thick in idiots and where the brain is small: 'hence,' he observes, 'the propriety of the term *thick-headed*, as a synonym for *stupid*, derives some confirmation from anatomy.' A continuation of the same process of resorption which causes the diplöe gives rise to the cavities known as the frontal and sphenoid sinuses: see SINUS. The formation of the diplöe divides the walls of the cranium into three layers—viz., an outer tough layer; an inner dense, brittle, somewhat glass-like layer, known

as the vitreous table or layer; and the intervening cancellous diplöe. The vitreous table, being more brittle than the outer layer, is apt to be fissured to a greater extent in fracture of the S.; and is even sometimes broken while the outer layer, which received the blow, has remained entire; though the diplöe must have great power in lessening the concussions transmitted from the outer to the inner layer of the skull. The growth of the S. after the 7th year proceeds slowly, but a slight increase goes on to about the age of 20. The S.-bones are freely supplied with blood from

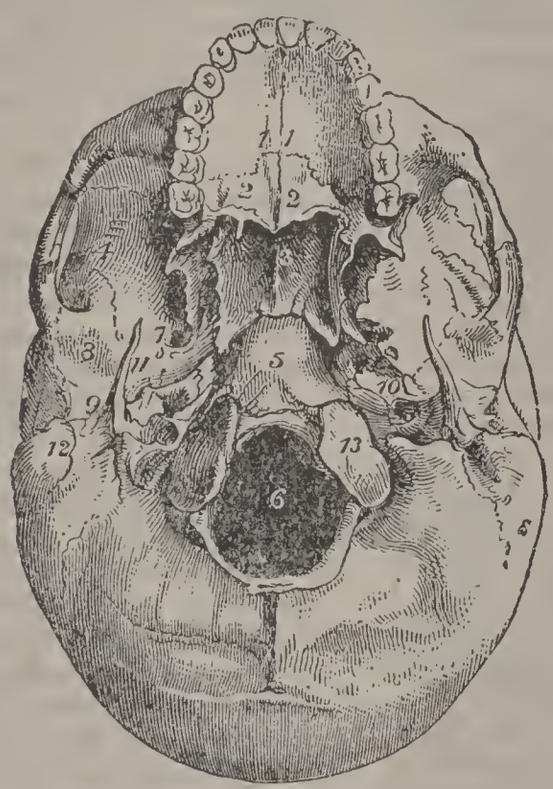


Fig. 4:

1, 1, Hard palate, formed by the palate processes of the superior maxillary bone; 2, 2, Palate bones; 3, Vomer, dividing the openings of the posterior nostrils; 4, Zygomatic fossa; 5, Basilar process of the occipital bone; 6, Foramen magnum, through which the spinal cord passes; 7, Foramen ovale; 8, Glenoid fossa, in which the head of the lower jaw-bone lies; 9, External auditory foramen; 10, Carotid foramen of the left side; 11, Styloid process; 12, Mastoid process; 13, One of the condyles of the occipital bone.

arteries which pass from the dura-mater internally and the pericranium externally, through the numerous foramina observed on both surfaces; the blood being returned by veins which take various directions.

The S. with its rounded shape forms a strong protection for the brain. Its weakest part is at the base, where fracture takes place sometimes when the S. is not broken at the part struck. There are two points remarkable in the architecture of the bones of the face: (1), the great strength of the nasal arch; (2), the immobility of the upper jaw, which is fixed by three buttresses, the nasal, the zygomatic, and the pterygoid

The base of the S., whether seen from within or from

below, presents many objects of physiological interest, in relation to the nervous system. As seen from within, the base presents on each side three fossæ, corresponding to the anterior and middle lobes of the cerebrum and to the cerebellum. These fossæ are marked, as is the whole S.-cap, by the cerebral convolutions; and they contain numerous 'foramina' and 'fissures' which give passage to various sets of nerves and blood-vessels. The external or outer surface of the base of the S., considered from before backward, is formed by the palate processes of the superior maxillary and palate bones; the vomer; the pterygoid and spinous processes of the sphenoid and part of its body; the under-surface of the temporal bones; and by the occipital bone. Its most important parts are named in the description of fig. 4.

The anterior region of the S., which forms the face, is of irregularly oval form; and the bones are so arranged as to inclose the cavities for the eyes, the nose, and the mouth, and to give strength to the apparatus for masticating food. The size of the face and the capacity of the cranial cavity are in an inverse ratio to one another, as may be readily seen by comparing vertical sections (through the mesial line) of human and other mammalian skulls; and if, instead of mammalian skulls, we take skulls of lower vertebrates (the crocodile, e.g.), this ratio is far more striking. In man, the face is at its *minimum* as compared with the cranial cavity, chiefly in consequence of the facial bones being arranged nearly vertically beneath the cranium, instead of projecting in front of it. The human face is remarkable also for its relatively great breadth, which allows the orbits for the reception of the eyes to be placed in front instead of on the sides of the head, and renders their inner walls nearly parallel. This parallelism in man is associated with the parallelism of the optic axes, and contributes to that clear, accurate, and steady vision which results from the ready convergence of the eyes upon every object. Each orbit is of pyramidal form, with the apex behind; and is composed of seven bones—the frontal, ethmoid, lachrymal, sphenoid, superior maxillary, malar, and palate, which last contributes very slightly to the human orbit; but is an important constituent in the orbit of many animals. For the nasal cavities, see NOSE.

The different varieties of mankind present certain well-marked and characteristic peculiarities in the form of the S. There are *three typical forms* which seem well established from examination and comparison of a large number of crania—viz., the *prognathous*, the *pyramidal*, and the *oval* or *elliptical* cranium. When the upper jaw slopes forward, the insertion of the teeth, instead of being perpendicular, is oblique. A S. with this peculiarity is *prognathous* or *prognathic* [Gr. *pro*, forward; *gnathos*, jaw]; the opposite condition being termed *orthognathous* or *orthognathic* [Gr. *orthos*, upright]: the Negro of the Guinea Coast and the Negrito of Australia present the prognathous character in its most marked form. The pyramidal form is characterized by the breadth and flatness of the face.

which with the narrowness of the forehead, gives this shape to the head: the Mongolian and Esquimaux skulls

Fig. 5.—Prognathous Skull of a Native Australian.

belong to this type. The oval or elliptical type is presented by the natives of w. or s. Europe and their descendants in N. America; and is not distinguished by any particular ferature so much as by absence of the longitudinal projection of the first type, or the lateral projection of the second, and by a general symmetry of the whole configuration. The length of the S., which to a great degree corresponds to the degree of development of the posterior cerebral lobes, has been taken by Retzius as a basis of classification. He arranges all the varieties of mankind into two great classes—the *Dolicocephalæ*, or *long-heads*, whose cerebral lobes completely cover the cerebellum; and the *Brachycephalæ*, or *short-heads*, in whom the cerebral lobes do not extend so far. Each of these classes contains *orthognathous* and *prognathous* varieties. See ETHNOLOGY.

Fig. 6.—Pyramidal Skull of Mongolian Race.

The *Morphology of the Skull* is the highest and most difficult problem of comparative anatomy, and has cost extraordinary labor for its solution. Goethe and Oken independently suggested that the S. was to be regarded as the modification of a series of four vertebræ, and this 'vertebral theory' was worked out in elaborate detail by Owen and other anatomists (see OKEN). Huxley, however, in a celebrated Croonian Lecture (1858), revised and extended the hitherto neglected embryological observations of Rathke, proposed an unanswerable destructive criticism of the archetypal theory, and may be said to have thus definitely placed the newer view in the way of general acceptance. An enormous amount of detailed research, for which we are indebted chiefly to Parker in England, and Gegenbaur in Germany, and which is still in progress, has established the newer theory on sure grounds of actual observation. 'The osseous cranium,' writes Prof. St

George Mivart, 'apart from the sense-capsules) consists of three arched segments.... These have been called *cranial vertebræ*, and certainly if the essence of vertebræ consists in their being a series of solid rings, fitted together and inclosing a tract of the nervous centres, then it must be admitted that the cranium—in the highest class of animals at least—is made up of three such vertebræ.'

Taking first the simple unsegmented cartilaginous cranium of a skate or dog-fish, with its appended jaws and branchial arches, we find that in development, though the notochord extends into the region of the head, the vertebræ stop altogether short of it; but that on each side of the cranium there arise a pair of cartilaginous bars—the *trabeculæ* or 'rafters' of the future S.; three pairs of cartilaginous capsules, nasal, ocular, and auditory, form round the developing sense organs; the nasal capsules immediately unite with the ends of the trabeculæ, which are meanwhile uniting below and growing up at the sides to form the brain-case. The auditory capsules become united with the trabeculæ by the appearance of two new masses of cartilage—the parachordals—the eyes of course remaining free. At first there are no jaws, but a series of seven or more similar vertical cartilaginous bars or arches, considerably resembling the trabeculæ, between which slits open into the pharyngeal cavity. The first pair of these arches develops an ascending process, which passes above the developing mouth, and becomes the 'palato-pterygoid' arch or upper jaw, the original portion remaining as the mandible. The second pair of arches—the 'hyoid'—becomes more or less modified usually to aid in supporting the jaws and floor of the mouth, while the remaining pairs become little modified, and serve throughout life to support the gills.

The more complex bony skulls of higher vertebrates are now in principle readily understood. The chondro-cranium and subjacent arches in all cases develop in the same way, though reduction and even atrophy of the gill arches subsequently takes place. The bones, though similar in the adult, originate in two utterly distinct ways, either by actual ossifications in the substance of the chondro-cranium and jaws, or by the ossification of overlying dermis; and are hence known as cartilage bones and membrane bones respectively—the latter corresponding to the dermal bones and teeth of ganoid and elasmobranch fishes. In mammals, a further extraordinary specialization takes place: the ends of the mandibular and hyoid arches lose their suspensory function, are taken up during development into the interior of the ear capsule, and are metamorphosed into the auditory ossicles: see SKELETON.

Fracture of the Skull may take place either in the vault or at the base of the skull. We consider first *fractures of the vault.* The fracture is usually direct, the bone giving way at the point at which it was struck; the result being either a simple fissure, or a breaking of the bone into several fragments (comminuted fracture). Although fractures may be limited to the outer or to the inner surface of the

skull, they usually extend through the whole thickness, and the broken bone is generally driven inward; and the most ordinary form of fracture with depression is that in which several fragments of somewhat triangular shape have their points driven down and wedged into each other, while their bases remain on a level with the surrounding bone. There are no signs by which we can in all cases recognize the existence of fracture of the vault. Fissures constantly exist without ever having been suspected during life. When, however, the fracture is accompanied by a wound leading down to the bone, it may, in general, be easily detected. In treatment, it is now an established rule that simple fractures of the skull with depression, and without symptoms, are to be left without operative interference. The depression may be so marked as to be easily detected; yet so long as there are no symptoms, all operative interference, of whatsoever form, is carefully to be avoided. If, however, there be a wound leading down to the bone in a depressed fracture without symptoms, immediate operative interference is called for. When a depressed fracture is accompanied by primary brain-symptoms, an operation for the purpose of raising or removing the depressed fragments is usually necessary.

Fractures of the base may be direct or indirect, but in most cases are indirect—i.e., the bones give way at a point remote from the seat of the blow, as above shown. At certain parts, however, the bones of the base are so thin that, if direct pressure be brought on them, they readily give way. Thus scissors, slate-pencils, tobacco-pipes, etc., have often been thrust into the skull through the orbits or the nostrils; and such wounds are very serious, from the readiness with which the brain may be thus injured. The only symptoms that can be trusted as indicating a fracture of the base of the skull are connected either with an escape of the substance of the brain or blood or watery fluid, or with an injury done to the nerves as they emerge at the base. Out of 32 cases of fractured base, bleeding from the mouth or nose occurred in 14, and from the ear in 15 cases.

SKULL'CAP (*Scutellaria*): genus of plants, of family *Labiatæ*, or Mint family. The calyx, closed in fruit, has a helmet-like appendage on the upper side; the blue or violet corolla is a long curved tube, the upper lip arched, entire or barely notched, and the lower pair of stamens are one-celled. Of the species with terminal flowers, the narrow, toothless-leaved *S. integrifolia*, with corolla 1 in. long, is found from Massachusetts southward; *S. pilosa*, with crenate leaves and shorter flowers, in open ground from New York and Michigan southward. *S. versicolor*, with slender tube, whitish below, and above deep blue, purple-spotted; *S. canescens*, having many-flowered racemes, and the leaves with hoary down beneath; and *S. serrata*, with serrate leaves acuminate at both ends, are southern and western.

Of the species with flowers axillary, and of wider range, are *S. nervosa*, the leaf-veins prominent beneath; *S. parvula*, 3–6 in. high; and *S. galericulata*, with lower lip longer than the upper. *S. laterifolia*, often with both axillary flowers and terminal one-sided racemes, is common in wet, shaded places; and, as a supposed cure, was called Mad-dog Skullcap. They all are bitter perennial herbs, of no medicinal virtue.

SKUNK, n. *skŭngk* [N. Amer. *seganku*]: American animal allied to the weasel, which has the power of ejecting an intolerably fetid liquid. SKUNK'ISH, a. *-ĭsh*, resembling the skunk, especially in its odor.—*Skunk* (*Mephitis*) is the name of a genus of quadrupeds of the Weasel family (*Mustelidæ*), but departing considerably from the typical characters of that family, and approaching the badgers and gluttons in general appearance, in habits, in the lengthened claws of the fore-feet, in the plantigrade hind-feet,

Common Skunk (*Mephitis mephitica*).

and in some of the teeth. There are six incisors and two canine teeth in each jaw, eight molars in the upper, and ten in the lower; the teeth generally resemble those of the polecat. Skunks depend much for defense against enemies on an excessively fetid fluid, secreted by glands near the anus; and when assailed, they turn the rump toward the assailant, elevate the tail, and discharge this fluid with considerable force. The odor proceeding from it, even when a dead S. had been flung into an inclosure, has been known to cause nausea to the inmates of an apartment with closed windows at the distance of 100 yards. So confident does the S. seem of the efficacy of its peculiar mode of defense, that it permits itself to be approached till it is just on the point of being seized—which, however, is attempted only by the inexperienced—when the battery is discharged. It is almost impossible to remove the odor from clothes. Dogs flee at once, and rub their noses on the ground till they bleed: dogs that are aware of the S.'s powers, however, kill it by leaping upon it suddenly in such a way that they are not exposed to its peculiar assault. There is much uncertainty concerning the species of S., as the colors vary considerably even in the same species; but there is no doubt of the existence of a number of species. They are found only in America, where they are very

widely distributed from Hudson's Bay to the Strait of Magellan. The COMMON S. (*M. mephitica*) is about the size of a cat, generally black or blackish brown, with the white of the crown diverging into two white streaks. It inhabits burrows which it makes in the earth; feeds on mice, frogs, etc., and also on insects and fruits; and sometimes enters houses to plunder store-rooms, where, if it is suddenly alarmed, everything is tainted with an intolerable odor. White streaks on the back, one or more, are very characteristic of this genus.

Conepatus mapurito, black with a broad white band on the back, belongs to the s.w. United States. The small *Spilogale putorius* has been tamed at the south, to serve against vermin, instead of a cat. It was found as far n. as Iowa by H. W. Parker, and two skins sent by him are pictured in Coues's *Fur-bearing Animals.* The interrupted white markings on the back and sides resemble a harp.

SKUNK CABBAGE (*Symplocarpus fœtidus*—Gr. *sumploke*, complex; *karpos*, fruit): plant of the Arum family *Araceæ*, nearly related to the Indian Turnip and Calla, and well named as to its odor. The fleshy spike (spadix) of minute flowers is globular; and the hood (spathe) is incurved, shell-shaped, very thick, purple, or spotted and striped with purple and yellow or green, and withers as the fruit matures—a spongy mass with seeds beneath the surface. The first flowers appear very early in spring, rising little above the ground; later, the large heart-shaped leaves, 1–2 ft. long. The leaves have been used in medicine as dressing to prolong blistering and suppuration. The thick root-stock has been employed as an expectorant and stimulant, having some virtue when fresh. The purplish seeds, dropped from the decaying spadix, are bulblet-like, ⅓ to ½ in. in diameter. The plant is common in moist ground.

SKUPSHTINA, *skŏpsh'tĭn-â* [Serb]: the legislative body of the kingdom of Servia. It consists of 178 members chosen for 3 years. Of the members, three-fourths are elected by the people, the rest are named by the crown. The word S. in Serb means assembly, meeting, in general; the full designation of the Servian legislative assembly is 'Narodna Skupshtina.'

SKURRY, n. *skŭr'rĭ* [OE. *scur*, to move hastily: Gael *sgiorr*, to slide or stumble: Dan. *skurre*, to jar]: confused haste, used in the familiar phrase HURRY-SKURRY, n. *hŭr'-rĭ-skŭr'rĭ*, impetuous haste.

SKY, n. *skī* [Sw. and Dan. *sky*, a cloud: Sw. *skyn*, the sky or heaven: Icel. *sky*, a cloud: connected with AS. *scuwa;* Dut. *schæde;* Gr. *skia*, shadow, shade—*lit.*, a cloud, then the clouds]: the region of clouds which surrounds the earth; the vault of the heavens; the firmament; climate: plu. SKIES, *skīz:* V. *familiarly*, to hang very high, said of a picture in an exhibition. SKY'ING, imp. SKYED, pp. *skīd:* ADJ. surrounded by skies. SKYEY, a. *skī'ĭ*, resembling the sky; ethereal SKY'ISH, a. *-ish*, like the sky; in *OE.*, approaching the sky. SKY BLUE, azure. SKY-COLOR, a

particular kind of blue color; azure. SKY-HIGH, a. very high. SKYLARKING, among *seamen*, running sportively among the rigging; in *familiar language*, running and larking about any place; rough jocular play. SKY-LIGHT, a window in the roof of a building. SKY-ROCKET, *-rŏk'ĕt*, a rocket that burns as it ascends. SKY-SAIL, a sail sometimes set above the royal. SKY-SCRAPER, a sky-sail of a triangular form; in America, a name applied to a very high building. SKYWARD, ad. toward the sky. OPEN SKY, a sky without clouds; with no covering or shelter from the sky.

SKYE, Scotland: the largest island of the Hebrides, off the western coast of Inverness, covers an area of 535 sq.m. Its scenery is celebrated. The deeply indented coast is lined by bold and lofty cliffs or basaltic pillars; the interior is mountainous moorland, interspersed with lochs. The Cuchullin Hills at the s. form the highest point of land, and toward the e., Blavin reaches an elevation of 3,042 ft. The Red Hills (2,403 ft.) rise toward the n.e. The acreage is very small and there are few trees. The climate is variable and moist. Much of the land consists of pasturage. Sheep and cattle are raised, and fishing is a chief occupation. Portree, the chief town on the e. coast, has a good harbor. Pop. (1901) 13,883.

SKYE TERRIER. See TERRIER.

SKYLARK: a European lark (*Alauda arvensis*), one of the most popular European cage birds from the variety and power, rather than the quality of its song, and the ease with which its health is preserved in captivity. It inhabits all of Europe, many migrating s. in winter. The adult male is about 7 in. long; crown dark brown with paled edges, forming a crest; upper parts brown, each feather with a spot of darker hue; throat and upper part of breast grayish-brown, spotted with dark brown, abdomen yellowish-white, deepening into pale brown on the flanks; tail feathers various shades of brown. The female is a little smaller than the male.

The bird is famous wherever English is spoken and English poetry is read, for its flight-song, begun in early spring, and continued all through the summer. When it first rises from the earth, its notes are feeble and interrupted; as it ascends, however, they gradually swell to their full tone, and long after the bird has reached a height where it is lost to the eye, it still continues to charm the ear with its melody. It mounts almost perpendicularly, and by successive springs, and descends in an oblique direction, still chanting its rippling music.

The female forms her nest on the ground within some depression, which serves to hide and shelter it—often in grainfields. She lays four or five dirty white eggs, blotched and spotted with brown; and she generally produces two broods in a year. These prolific birds live on seeds and insects; they are most abundant in the

more open and highest cultivated situations abounding in grain. In winter they assemble in vast flocks, grow very fat, and are taken in great numbers for the table, especially in the Mediterranean region.

SKYROS, *skī'rŏs*, Greece: an island of the Ægean Archipelago, 25 m. e. of Eubœa. It is 18 m. long by 7 wide. It consists of two parts, connected by a mountainous isthmus. To one part belongs the mountain Kochilas; the other, or northern division, is lower and covered by fertile plains and slopes. The higher grounds are densely wooded. The products are wheat, wine, oil, and oranges. The raising of live stock—especially goats—is a considerable industry; also a species of small horses. A Greek monastery occupies the greater part of the modern Skyros. Theseus, the hero of Athens, died here, and his bones were carried to that town when under Kimon the Athenians took Skyros. Pop. 3,512.

SLAB, n. *slăb* [W. *llab*, a flag or thin strip—probably in the sense of a piece separated from the mass: Lang. *csclapa*, to split wood: comp. Norw. *sleip*, smooth]: a flat piece of marble or other stone; a flat mass of metal; the thick outside plank of a log of timber.

SLAB, a. *slăb* [see SLABBER]: in *OE.*, thick, glutinous; viscous: N. a puddle; mire. SLAB'BY, a. *-bĭ*, thick; viscous; sloppy.

SLABBER, v. *slăb'bėr* [Ger. *schlabbern*, to slabber one's clothes: Swiss, *schlabbete*, watery drink, broth: Dut. *slabberen*, to slobber: comp. Gael. *slaib*, mire]: to spill liquid food in eating; to slaver; to drivel: N. slaver. SLAB'BERING, imp. SLAB'BERED, pp, *-bėrd*. SLAB'BERER, n. *-bėrėr*, one who slabbers; an imbecile; an idiot.

SLABBER, n. *slăb'ėr:* in *metal-working*, a quick-motion machine for dressing the sides of nuts or heads of bolts; in *wood-working*, a saw for removing a portion from the outside of a log, so as to square it.

SLACK, a. *slăk* [Icel. *slakr;* prov. Ger. *schlack;* Sw. and Dan. *slak*, not tight, loose: AS. *sleac*, slack]: loose; relaxed; not tightly extended; backward; not busy, as applied to business men; not using due diligence: V., see SLACKEN: N. the part of a rope which has no strain upon it; a kind of small broken coal; in *Scot.* and *prov. Eng.*, a gap or hollow between hills: AD. partially; not intensely. SLACK'LY, ad. *-lĭ*, not tightly; loosely; remissly. SLACK'NESS, n. *-nĕs*, looseness; inattention; slowness; dulness, as in trade; tardiness; insufficiency. SLACK-BAKED, insufficiently baked, as bread. SLACK-DRIED, partially or insufficiently dried. SLACK-ROPE, a rope having no strain upon it. SLACK-WATER, the interval between the ebb and flow of the tide, during which there is no tide-current. SLACKEN, v. *slăk'n*, or SLACK, v. *slăk*, to loosen; to relax; to become less rigid; to make less tense or tight; to abate; to cease to flow, as the tide; to languish; to diminish in severity; to neglect; to lessen, as one's pace; to deprive of the power of cohesion, as

burnt limeshell. SLACKEN, n. in *metallurgy,* spongy, slaggy materials mixed with ores to prevent their fusion while roasting. SLACKENING, imp. *slăk'ning.* SLACKENED, pp. *slăk'nd:* also SLACK'ING, imp. SLACKED, pp. *slăkt.*—SYN. of 'slack, a.': remiss; backward; loose; relaxed; weak; neglectful; unbent; inactive; slow; tardy.

SLADE, n. *slād* [AS. *slæd*]: little dell or valley; a glade; a flat piece of low moist ground.

SLADEN, DOUGLAS (BROOKE WHEELTON): English author: b. London 1856, Feb. 5. He was educated at Cheltenham and Oxford, and was the first professor of history at the University of Sydney, N. S. W. Among his publications are: *Frithjof and Ingebjorg* (1882); *Australian Lyrics* (1882); *A Poetry of Exiles* (1883); *Edward, the Black Prince* (1886); *The Japs at Home* (1892); *In Sicily* (1901); *A Handbook to Sicily* (1903). He edited *Australian Poets* (1888); *Younger American Poets* (1891); *Who's Who* (1897-9).

SLAFTER, EDMUND FARWELL: American historian: b. Norwich, Vt., 1816, May 30. He was graduated from Dartmouth in 1840, took orders in the Episcopal Church and held rectorates in Massachusetts prior to 1877. He is the author of *Sir William Alexander and American Colonization* (1873); *Voyages of the Northmen to America* (1877); *John Checkley, or the Evolution of Religious Tolerance in Massachusetts Bay* (1897); etc.

SLAG, n. *slăg* [Ger. *schlacke;* Sw. *slagg,* dross of metals: Norw. *slagg,* spittle]: dross or refuse from metallic ores after being smelted; vitrified cinders. SLAG'GY, a. *-gĭ,* pert. to or resembling slag. SLAG'GINESS, n. *-gĭ-nĕs,* the state of smelted dross or refuse from a smelting-furnace.—*Slag* is a fused compound of silica and lime, alumina, and other bases; a secondary product in the reduction of metallic ores: called also Scoria (or Scoriæ) and Cinder—when discharged from a volcano. More or less of the metal always remains in a slag; in the early days of iron-smelting, the proportion of metal thus wasted was so great that some old slags have been profitably smelted in recent times. Slags, being silicates, are of the nature of glass, and externally have a glassy, crystallized, or stone-like character. They vary much in color and are sometimes so prettily veined and marbled that attempts have been made to apply them to ornamental purposes. Millions of tons of slag are annually produced at iron-smelting works. One mode of utilizing the material is by casting it in square blocks or bricks for building purposes. The slag is run into molds, either as it issues from the blast-furnace, or after being remelted; and it is very durable. Broken slag is used also as a covering for roads, but its brittleness and sharpness are objectionable. 'Mineral cotton' is produced by allowing a jet of steam to escape through a stream of liquid slag, by which it is blown into fine white threads, sometimes 2-3 ft. long. These threads break into

shorter ones, and the appearance of the substance is that of a mass of cotton-fibre. Being a poor conductor of heat, the long fibre is used in weaving a covering for boilers and steam-pipes. The short fibre ('mineral wool') is used for a deadening in floors of buildings.

In an archæological view, S. is interesting as pointing out the sites of ancient smelting-works, and as affording a clew to the primitive methods of obtaining the metals from their ores.

SLAIN, v. *slān:* pp. of the verb SLAY, which see.

SLAKE, v. *slāk* [see SLACK: Icel. *slakr*, not tight: Sw. *släcka*, to quench: Low Ger. *slakkern*, to be sloppy, to rain continuously; *slikk*, mud, ooze]: to quench, as thirst; to abate; to become extinct; to add water to, as lime, for the purpose of creating a chemical combination. SLA'KING, imp. SLAKED, pp. *slākt:* ADJ. mixed or besprinkled with water so as to be reduced to powder, as burnt limestone. SLAKED LIME, lime reduced to powder by water thrown upon it; hydrate of lime.

SLAM, v. *slăm* [Norw. *slemba*, to smack, to bang: Sw. *slamra*, to jingle, to clatter]: to strike with force and noise; to shut with violence; to win all the tricks at cards: N. a stroke with much noise; the violent shutting of a door; the refuse from alum-works. SLAM'MING, imp. SLAMMED, pp. *slămd.* SLAM-BANG, or SLAP-BANG, *familiarly*, with great violence.

SLANDER, n. *slăn'dĕr* [OE. *sclaundre;* F. *esclandre*, scandal, discredit—from L. *scandălum;* Gr. *skan'dalon*, cause of offense, a snare]: false tale or report or defamatory words, tending to injure the reputation of another; defamation: in *OE.*, disgrace; reproach; ill name: V. to injure by maliciously spreading a false report; to defame. SLAN'DERING, imp.: ADJ. defaming; belying. SLAN'DERED, pp. *-dĕrd.* SLAN'DERER, n. *-dĕr-ĕr*, one who slanders. SLAN'DEROUS, a. *-ŭs*, that utters or contains defamatory words; calumnious: in *OE.*, scandalous; shameful. SLAN'DEROUSLY, ad. *-lĭ.* SLAN'DEROUSNESS, n. *-nĕs*, state or quality of being defamatory.—SYN. of 'slander, v.': to asperse; calumniate; vilify; defame; reproach; scandalize. —*Slander* is in general whatever imputes an offense punishable by the criminal courts, or disgraceful, fraudulent, or dishonest conduct; or even tends to make a man contemptible in his private relations and shunned by his friends and neighbors. Thus, whatever imputes a contagious or an infamous disease is a S. Words imputing gross ignorance or misconduct affecting one's trade or profession are actionable, as calling a man a bankrupt grocer, a quack doctor, etc. To be slanderous, the words spoken must be false. The words must have been uttered with regard to the complainant: thus, a mother has no action for S. against one who calls her child a bastard. The remedy for S. is an action at law for damages: see LIBEL.

SLANG, v. *slăng:* pt. of SLING, which see.

SLANG, n. *slăng* [Norw. *slengja*, to fling, to cast; *slengjeord*, a slang word, an insulting allusion]: term applied to those familiar and pithy words and phrases, both coarse and refined, which have their origin by accident or caprice, are in use by persons in every grade of life, and which float about and change with fashion and taste, but not without leaving in some cases permanent and recognized additions to the language: low, vulgar language. SLANGY, or SLANGEY, a. *slăng'ĭ*, characterized by slang words; abounding in slang; like slang.—*Slang* denotes a burlesque style of conversational language, originally found only among the vulgar, but now more or less in use among persons of some cultivation. It is somewhat allied to, though distinct from, *cant* (in French, *argot*), the language used for purposes of concealment by thieves and vagrants of all descriptions.

S. was known in the classic ages of Greece and Rome, and abounds in the writings of Aristophanes, Plautus, Terence, and Martial. Every modern European language has its S. In England, the 'Rump,' the 'Barebones Parliament,' the terms 'Roundheads,' 'Puritans,' 'Quakers,' all belonged to the S. of the 17th c.; so, too, the political terms 'slate,' 'wire-pulling,' 'pipe-laying,' 'filibustering,' 'dough-face,' belong to the vocabulary of S. *Hudibras* and the dramatic works of the 18th c. abound in S. Old English S. was coarser than that now in use, but the greater portion of its phraseology had a somewhat restricted circulation, not permeating every species of conversation to the extent that modern S. does. Toward the close of the 18th c., the S. vocabulary received large additions from pugilism, racing, and 'fast life;' and its fashionable vulgarisms came into great favor during the minority of the prince regent. In the 19th c. the growth of refinement in manners and ideas has not banished S., but given it a more familiar and utilitarian character, while it has been introduced to some extent into circles where it was formerly unknown.

S. consists in part of new words, in part of words of the legitimate language invested with new meanings, such as are assigned to the verbs to *cut*, to *do*. Many S. expressions are derived from thieves' cant, and some from the gypsy tongue. Their derivations are often indirect, arising out of fanciful allusions and metaphors, which soon pass out of the public mind, the word remaining, while its origin is forgotten. The origin of much current S. may be traced to the comic stage and to popular novels.

There is a S. attached to various professions, occupations, and classes of society. The S. of fashionable life and fashionable novels comprises a number of French words and phrases, whose application is often very different from that current in France. The *beau monde*, a *chaperon*, a marriage being on the *tapis*, are expressions which, in their English sense, are utterly unknown in Paris. The stock exchange has made large contribution to the S. vocabulary, e.g., 'bull,' 'bear,' 'long,' 'short,' 'lambs,' etc.; equally large is the contribution of the prize-ring,

e.g., 'knock-out,' 'in chancery,' 'striking below the belt,' 'throw up the sponge,' etc. We have also college and university S., religious S., literary S., civic S., etc.

SLANT, a. *slănt* [Low Ger. *slindern*, to slide: W. *ysglentio;* Sw. *slinta*, to slide, to slip]: sloping; oblique, inclined from a direct line: N. an inclined plane: V. to turn from a direct line; to give a sloping direction to; to incline. SLANT'ING, imp.: ADJ. inclining from a right line; having an oblique direction. SLANT'ED, pp. SLANT'INGLY, ad. *-lĭ.* SLANT'WISE, ad. *-wīz.* SLANT'LY, ad. *-lĭ*, obliquely; in an inclined or slanting direction.

SLAP, n. *slăp* [Low Ger. *slapp*, a box on the ears: Dan. *slap;* Ger. *schlapp*, slack, loose: Ger *schlappen;* Low Ger. *slabben*, to lap or suck up with a noise: an imitative word]: a blow given with the open hand, or with anything broad and flat: V. to strike with the open hand, or with a broad flat thing; to smack: AD. with a sudden violent blow. SLAP'PING, imp.: ADJ. *familiarly*, rapid, as a *slapping* pace. SLAPPED, pp. *slăpt.* SLAP-DASH, ad. all at once; in an offhand manner; with wild aim; precipitately. SLAP-JACK, a kind of pancake. SLAPPER, a. *slăp'pĕr, familiarly*, very large; of great size. SLAP-BANG, ad. violently. SLAP UP, in *slang*, dashing or very exquisite; first-rate.

SLASH, v. *slăsh* [a word imitative of a blow like a dash among a liquid: Dan. *slaske*, to dabble: Sw. *slaska*, to be sloppy: comp. Gael. *slais*, a lash]: to cut by striking violently at random; to strike at random with a sword or other edged instrument; to slit; to crack, as a whip: N. a cut made at random with a sword, or knife, or whip; a long cut. SLASH'ING, imp.: ADJ. cutting at random; cutting up: sarcastic, as a *slashing* review. SLASHED, pp. *slăsht:* ADJ. having long narrow openings, as a sleeve, etc., to show a brighter-colored cloth beneath; in *bot.*, deeply gashed; divided by deep and very acute incisions.

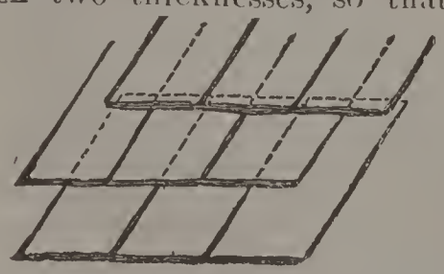
SLATCH, n. *slăch* [from SLACK, which see], among *seamen*, the middle or slack part of a rope; an interval of fair weather.

SLATE, n. *slāt* [OE. *sclat*, stone used for roofing: OF. *esclat*, a splinter; *esclater*, to crack: AS. *slitan;* Icel. *slita*, to rend: Scot. *sklate;* Gael. *sgleat*, a slate]: any rock that can be split into thin laminæ or plates; argillaceous rocks whose lamination is produced by cleavage; a thin plate of stone for roofing, or for writing on: *foliated rocks*, like gneiss and mica-schist, are termed *schists* and not *slates;* thinly bedded sandstones are called *flagstones* or *tilestones:* ADJ. made or consisting of slate: V. to cover or roof with slates; to criticise severely, as to *slate* a book. SLA'TING, imp.: N. the cover of slates put on a roof; materials for covering a roof. SLA'TED, pp. SLA'TER, n. *-tĕr*, one whose occupation is to cover roofs with slates, etc. SLA'TY, a. *-tĭ*, resembling slate; having the cleavable structure of clay-slate. SLA'TINESS, n. *-tĭ-nĕs*, the state or quality of being slaty. SLATE COAL, a hard coal that can readily be split into pieces. SLATE-GRAY, blue, with a large admixture of gray. SLATE-PENCIL, a pencil of soft

slate for writing on slates—either a cut or turned stick of soft slate or like material, or made by pressing moistened slate powder into a firm dry stick. SLATE-SPAR, calcareous spar—so called from its occurring in thin slaty laminæ. A SLATE LOOSE, not quite sound in mind.—*Slate* or *Clay-slate* is a highly metamorphosed argillaceous rock, fine-grained and fissile, and of dull blue, gray, green, or black color. It splits into thin laminæ or plates, altogether independent of the layers of deposit; though sometimes coinciding with them, they more frequently cross them at different angles: see CLEAVAGE. A good example may be seen from the cars on the Lehigh Valley r.r., at Slatington, Penn., where the slates are transverse to the bedding. The theory accepted is that the lateral pressure which acted from the sea inland, ridging the crust, produced the lamination. The same effect on a mass of clay under hydraulic pressure was produced by Prof. Tyndall. Thus, nature has made slates ready-cut, and set up like thin volumes in a library. Some rocks that split into the thin plates of the original stratification are popularly but erroneously named S., as the thin bedded sandstones properly called flagstones or tilestones, the fissile shales of Cambrian and Silurian age, and the metamorphic, gneiss, and mica schist, whose planes of division correspond to their stratification.

True S. is a very compact rock, little liable to be acted on by atmospheric agencies. It is obtained chiefly from Paleozoic strata, but is found also among more recent rocks It is used for various purposes, being split into thin slabs of small size for roofing of houses, and into larger slabs for fitting up dairies, etc., and even for making billiard-tables; and it is split and polished by means of pumice for writing-slates. There are extensive quarries of roofing-slate in the United States and Canada, in the British Isles, in France, Belgium, Sweden, Norway, Germany, Austria, and Italy. The S. product of the United States (1889) amounted in value to $3,444,863. Penn. produced $2,011,776 worth, Vt. $838,013, Me. $214,000. A hard compact S. is best for roofing; that which is porous imbibes water, the freezing of which splits it in winter, while it affords also a soil for mosses, which soon injure the roof.

In roofing with slates, it is necessary to put on the slates in two thicknesses, so that the sloping joints may be covered by the overlap of the course above. Besides this, the third course must also cover the first by an inch or two, to prevent rain from penetrating. Slates are generally laid upon boarding, and nailed with malleable-iron nails, japanned to prevent them from rusting.



SLATER, *slā'tėr*, JOHN FOX: 1815, Mar. 4—1884, May 7; b. Slatersville, R. I.; nephew of Samuel Slater. He became a resident of Norwich, Conn., extended his father's cotton-manufacturing business, and gained a large fortune by profitable investments. He gave of his wealth liberally for educational work, aiding largely in the founding of the Norwich Free Acad.; and 1882 he established the 'Slater Fund' (q.v.). He died at Norwich.

SLA'TER, SAMUEL: 1768, June 9—1835, Apr. 21; b. Belper, Derbyshire, England: introducer of the Arkwright cotton-machinery into the United States. He was apprentice of a partner of Arkwright, and came to this country 1789, attracted by a bounty offered by Pennsylvania. Cotton-machinery had been in use in Beverly, Mass., and elsewhere; but Arkwright's invention of spinning by rollers was a great advance (see COTTON). No model or plans of it could be brought; and, encouraged by Moses Brown of Providence, Slater went to Pawtucket, R. I., and reproduced the new spinner entirely from memory, 1790, together with other machinery invented in the previous decade; beginning the manufacture that year, with a product as good as that of British mills. In 1806 he and his brother, John Slater, founded the works in Slatersville, R. I.; in 1812 those at Webster (formerly Oxford), Mass.: there also he began manufacture of woolen fabric. He became very rich by these enterprises, and others in iron-mills, etc. In 1796 he opened, for his operatives, one of the first Sunday schools in this country. He died in Webster. His life was published by George S. White (1836).

SLATER FUND: the gift of John Fox Slater, of Norwich, Conn., to the cause of educating the negroes of the South, was originally the sum of $1,000,000. The gift was made in 1882, to a board of trustees, who were to hold the principal and expend the interest in promoting institutions already established on a permanent basis. In acknowledgment of this philanthropy Congress voted the donor thanks and a medal. By the terms of the gift neither principal nor income is to be expended on buildings or grounds. The fund is expended principally in helping students of, and preparing teachers for, the manual training schools, agricultural and mechanical colleges and technological institutions. The fund is a potential agency in working out the problem of the education of the negro, and over $500,000 has already been expended. By the extraordinary fidelity and financial ability of the treasurer, the fund, while keeping up annual appropriations, has increased to $1,500,000. Schools established by states, denominations, and individuals are helped by annual donations. Among the most prominent are the Hampton Normal and Industrial, the Spelman, the Tuskegee, and schools at Orangeburg, S. C.; Tougaloo, Miss.; Marshall, Tex.;

Raleigh, N. C.; New Orleans; the Meharry Medical College, at Nashville, etc.

SLATTERN, n. *slăt'tėrn* [Ger. *schlottern,* to hang flapping about one, as clothes: Dut. *slodderen,* to hang and flap: Swiss, *schlodig,* negligent in dress: Bav. *schlütt,* a dirty person]: a woman negligent of her dress: one who is not neat or nice. SLAT'TERNLY, a. *-lĭ,* not clean; slovenly; untidy; ADJ. negligently.

SLAUGHTER, n. *slaw'tėr* [Icel. *slá,* to strike; *slatr,* butcher's meat: Dan. *slaae;* Ger. *schlagen,* to strike (see SLAY)]: great destruction of life by violence; carnage; butchery; a killing of oxen, sheep, etc., for human food: V. to make great destruction of life by violence; to massacre; to kill beasts for the market. SLAUGH'TERING, imp. SLAUGH'TERED, pp. *-tėrd.* SLAUGH'TERER, n. *-tėr-ėr,* one who slaughters. SLAUGH'TEROUS, a. *-ŭs,* murderous; destructive. SLAUGH'TEROUSLY, ad. *-lĭ.* SLAUGHTER-HOUSES, erections where beasts are killed for market. SLAUGHTER-MAN, one employed to kill beasts for human food.—SYN. of 'slaughter, n.': massacre; butchery; murder; havoc; carnage.

SLAUGHTER HOUSE CASES, THE: arose out of laws passed in 1869 by the legislature of the State of Louisiana in an act intended to protect the public health in the city of New Orleans and to that end incorporating a company, giving it the sole right 'to land, keep, or slaughter any cattle, beeves, sheep, swine, or other animals . . . within the city of New Orleans, or at any point or place . . .' on the east or west banks of the Mississippi River, opposite the corporate limits of the city. This act was bitterly opposed and an injunction was obtained on the ground that the law was unconstitutional; when the case was tried the court made the injunction perpetual, on the ground that it was in opposition to the 14th Amendment to the Constitution, and to the first and second sections of the State 'Bill of Rights.' After several appeals, a divided opinion was rendered by the Supreme Court in 1873 which recognized the validity of the act and permitted the exercise of the powers conferred by it. The decisions of this case are considered extremely important because they not only discuss the police powers of the States, but because of the interpretations of the clauses in the Federal Constitution brought into issue. The case is reported in 16 Wallace, 36, Supreme Court reports.

SLAV, or SLAVE, *slâv,* or SCLAV, or SCLAVE, n. *sklâv* [Russ. *slava,* glory, i.e., the glorious race (but see SLAVS), a people of e. Europe, from whom the anc. Germans drew many of their *slaves;* now comprising the Russians, Bulgarians, Illyrians, Poles, Bohemians, etc.]: native of Slavonia; more widely, one of the people called SLAVS (q.v.); also the language. SLAVONIAN, a. *slă-vō'-nĭ-ăn,* or SLAVON'IC, a. *-vŏn-ĭk,* pertaining to Slavonia, its

people, or its language: spelled also Sclavonian, Sclavonic.

SLAVE, n. *slāv* [F. *esclave;* Ger. *sclave,* a slave; a term taken from *Sclave,* a member of the Sclavonian race, a common source for slaves in early times: Russ. *slava,* fame, glory (see SLAV: SLAVS)]: any one held as a bond-servant for life; a human being wholly the property of another: a Serf (q.v.); a drudge: one who surrenders himself wholly to any power, as to an appetite, or to the influence of another: V. to drudge; to toil unremittingly. SLA'VING, imp. SLAVED, pp. *slāvd.* SLAVER, n. *slā'vėr,* a ship fitted for carrying slaves. SLA'VERY, n. *-ĭ,* the state of being absolutely the property of another for life; bondage for life; exhausting and mean labor; drudgery; captivity (see below). SLA'VISH, a. *-vĭsh,* pertaining to slaves; mean; servile; meanly laborious. SLA'VISHLY, ad. *-lĭ.* SLA'VISHNESS, n. *-nĕs,* the state or quality of being slavish. SLAVE-BORN, born in a state of slavery. SLAVE-CATCHER, one whose occupation is to pursue and capture runaway slaves. SLAVE-CATCHING, the business of a slave-catcher. SLAVE-COFFLE, *-kŏf'fl* [Ar. *kafala,* a caravan]: a band of slaves to be sold. SLAVE-DRIVER, one who superintends slaves when at work. SLAVE-HOLDER, or -OWNER, one who possesses slaves. SLAVE-HUNT, hostile incursion for capture of persons to make slaves of them; search after fugitive slaves. SLAVE-SHIP, ship employed in carrying slaves. SLAVE-TRADE, traffic in slaves; the purchasing or kidnapping human beings for slaves, particularly on the coast of Africa, in order to carry them to distant countries.—SYN. of 'slave, n.': bond-man or -woman; bond-servant; drudge; dependent; serf; captive; vassal; henchman.

SLAVER, n. *slăv'ėr* [a variation of SLABBER: Icel. *slafra,* to lick: Norw. *sleve,* slaver or drivel: L. *saliva,* spittle]: saliva drivelling from the mouth; drivel: V. to emit spittle; to smear or foul with saliva issuing from the mouth; to be smeared with spittle. SLAV'ERING, imp. SLAV'ERED, pp. *-ėrd.* SLAV'ERER, n. *-ėr-ėr,* a driveller; an idiot.

SLAVE COAST: Africa; a name formerly and still sometimes applied to a part of the coast of the Gulf of Guinea, from the mouth of the Niger westward to the river Volta. It is the coast of Togo, Dahomey and part of Nigeria, belonging, respectively, to Germany, France, and England. It received its name from the fact that its ports were the chief centers for the exportation of slaves.

SLAVE LAKE, LITTLE: Canada; a lake in Athabasca Territory, about 270 m. s.w. of Lake Athabasca. It is drained by the Lesser Slave river into the Athabasca or Elk river. It is about 60 m. long, and its greatest breadth is about 12 m. The surface of the lake is 1,890 feet above sea-level; it has been known to keep free from ice until Christmas.

SLAVERY, *slāv'ėr-ĭ :* condition of a person who is the property, or at the disposal of another who has the power and claims the right to employ or treat him as he pleases. Such is the state of the slave in the absolute sense; but S. has been subjected to innumerable limitations and modifications.

S. arose probably at an early period of the world's history out of the accident of capture in war. Savages, instead of massacring their captives, found it more profitable to keep them in servitude. All the ancient oriental nations of whom we have any records, including the Jews, had their slaves. The Hebrews were authorized by their law to possess slaves, not only of other races, but even of their own nation, though the latter were generally insolvent debtors, who had sold themselves through poverty, or thieves who lacked the means of making restitution; and the law dealt with these far more leniently than with stranger slaves. They might be redeemed; and if not redeemed, became free at the end of seven years from the beginning of their servitude; besides which, the law provided, every 50th year, a general emancipation of native slaves.

S. existed in ancient Greece; in the Homeric poems, it is the ordinary destiny of prisoners of war; and the practice of kidnapping slaves is also recognized—Ulysses himself narrowly escaping this fate. None of the Greek philosophers considered the condition of S. objectionable on the score of morals. Aristotle defends its justice on the ground of a diversity of race, dividing mankind into the free and the slaves by nature; while Plato desires only that no Greeks be made slaves. One class of Greek slaves were descendants of an earlier and conquered race of inhabitants, who cultivated the land which their masters had appropriated, paid rent for it, and attended their masters in war. Such were the Helots in Sparta, the Penestæ in Thessaly, the Bithynians at Byzantium, etc., who were more favorably dealt with than other slaves, their condition somewhat resembling that of the serfs of the middle ages. They could not be sold out of the country, or separated from their families, and were even capable of acquiring property. Domestic slaves obtained by purchase were the unrestricted property of their owners, who could dispose of them at pleasure. In Athens, Corinth, and the other commercial states, they were very numerous and mostly barbarians. They were employed partly in domestic service, but more as bakers, cooks, tailors, or in other trades, and in mines and manufactories; and their labor was the means by which the owner obtained profit for his outlay in their purchase. These slaves were mostly purchased; but few were born in their master's family, partly from the general discouragement of the cohabitation of slaves, partly from the small number of the female in comparison with the male slaves. An extensive slave traffic was carried on by the Greek colonists in Asia Minor with the interior

of Asia; and another source of supply was the practice common among Thracian parents of selling their children. In Greece in general, especially at Athens, slaves were mildly treated, and had a large share of legal protection. According to Demosthenes, a slave at Athens was in better condition than a free citizen in many other countries.

The Roman condition of S. differed in some particulars from that of Greece. All men were considered by the Roman jurists to be free by natural law; while S. was regarded as a state contrary to natural law, but agreeable to the law of nations, when a captive was preserved, instead of being slain; or agreeable to the civil law, when a free man sold himself, or a creditor held as a slave his insolvent debtor. In earlier times there was no restriction on the master's power of punishing or putting to death his slave; and even at a later period when the law on this head was much modified, slaves were used with considerable rigor. The estimation in which their lives were held is illustrated by the practice of gladiatorial combats; also by the conduct of Vedius Pollio, who, in the polite age of Augustus, flung such slaves as displeased him into his fish-ponds, to feed his lampreys, and on the matter being brought under the emperor's notice, was visited with no severer punishment than the destruction of his ponds. Old and useless slaves were often exposed to starve in an island of the Tiber. Under the empire, the cruelty of masters was in some degree restrained by law. It was enacted that a man who put to death his own slave without cause should be dealt with as if the slave had been the property of another; and that if the cruelty of a master was intolerable, he might be compelled to sell the slave. A constitution of Claudius declared the killing of a slave to be murder, and it was also enacted that in sales of slaves, parents and children, brothers and sisters, should not be separated. A slave could not contract marriage, and no legal relation between him and his children was recognized. The children of a female slave followed the status of their mother. There were various ways in which a slave might be manumitted, but the power of manumission was restricted by law. The harboring of a runaway slave was illegal. The number of slaves in Rome, originally small, was increased much by war and commerce; and the cultivation of the soil came, in the course of time, to be entirely given up to them. During the later republic and empire, persons of good estate kept an immense number of slaves as personal attendants; and the possession of a numerous retinue of domestic slaves was matter of ostentation—200 being no uncommon number for one person. A multitude of slaves were also occupied in the mechanical arts and the games of the amphitheatre. Originally, a slave was incapable of acquiring property, all his acquisitions belonging to his master; but when slaves came to be employed in trade, this condition was mitigated, and it

became the practice to allow a slave to consider part of his gains, called his *peculium*, as his own, a stipulation being sometimes made that he should purchase his freedom with his peculium when it amounted to a specific sum.

Though the introduction of Christianity did not immediately put an end to S., it tended to ameliorate the slave's condition. Justinian did much to promote the eventual extinction of S.; and the church excommunicated slave-owners who put their slaves to death without warrant from the judge. But the number of slaves again increased; multitudes—mostly Slavonian captives (whence our word *slave*)—being brought in by the barbarian invaders; and in the countries which had been provinces of the empire, S. continued long after the empire had fallen to pieces, and eventually merged into the mitigated condition known as serfdom, which prevailed all over Europe in the middle ages, and has been gradually abolished in modern times: see SERF. But though the practice of selling captives taken in war as slaves ceased in the Christian countries of Europe, a large slave-traffic continued among Mohammedan nations, by whom Christian captives were sold in Asia and Africa; and in the early middle ages, the Venetian merchants traded largely in slaves, whom they purchased on the coast of Slavonia, to supply the slave-markets of the Saracens.

The negro S. of modern times was a sequel to the discovery of America. Prior, however, to that event, the negroes, like other savage races, enslaved those captives in war whom they did not put to death, and a considerable trade in slaves from the coast of Guinea was carried on by the Arabs. The deportation of the Africans to the plantations and mines of the new world doubtless raised the value of the captive negro, and made S. rather than death his common fate; while it may also have tempted the petty chiefs to make war on each other, for the purpose of acquiring captives and selling them. The aborigines of America having proved too weak for the work required of them, the Portuguese, who possessed a large part of the African coast, began the importation of negroes, in which they were followed by the other colonizers of the new world. The first part of the new world in which negroes were extensively used was Hayti, in St. Domingo. The aboriginal population had at first been employed in the mines; but this sort of labor was found so fatal to their constitutions that Las Casas, Bishop of Chiapa, celebrated protector of the Indians, interceded with Charles for the substitution of African slaves as a stronger race; the emperor accordingly, 1517, authorized a large importation of negroes from the establishments of the Portuguese on the coast of Guinea. Sir John Hawkins was the first Englishman who engaged in the traffic, in which his countrymen soon largely participated, England having exported 1680–1700 no fewer than 300,000

slaves from Africa, and 1700–86 imported 610,000 into Jamaica alone. A Dutch ship brought from the Guinea coast to Jamestown, Va., a cargo of negroes 1620: this was the beginning of S. in the English colonies in America. An English company obtained (1713) the monopoly of supplying negro slaves to the Spanish colonies for 30 yrs.: the contract having been annulled by Spain 1739, England declared war on Spain. The annual exportation of slaves from Africa was as follows about 1790: By the British, 38,000, French, 20,000, Dutch, 4,000, Danes, 2,000, Portuguese, 10,000: total, 74,000. Between 1680 and 1786 2,130,000 negro slaves were imported into the Brit. colonies of America and the W. Indies. The slave-trade was attended with extreme inhumanity; the ships which transported the negroes from Africa to America were overcrowded to such extent that a large proportion died in the passage; and the treatment of the slave after his arrival in the new world depended much on the character of his master. Legal restraints were, however, imposed in the various European settlements to protect the slaves from injury; in the Brit. colonies, courts were instituted to hear their complaints; their condition was to a certain extent ameliorated, and the flogging of women was prohibited.

Before emancipation was contemplated, the efforts of the more humane portion of the public were directed toward abolition of the traffic in slaves. The Friends (or Quakers) from the beginning condemned the slave-trade; in Pennsylvania they advised their members against embarking in the trade 1696; and 1776 required all members holding slaves to emancipate them. Societies were formed among the Friends to relieve the slaves in the colonies and to discourage the slave-trade. In 1787, a society for suppression of the slave-trade was formed in London, numbering W. Dellwyn, Thomas Clarkson, and Granville Sharp among its original members. The most active parliamentary leader in the cause was William Wilberforce, whose views were seconded by Pitt. A bill introduced by Wilberforce for putting an end to the further importation of slaves was lost 1791. Meanwhile, the conquest by the English of the Dutch colonies having led to a great increase in the British slave-trade, an order in council prohibited that traffic in the conquered colonies 1805; and the next year an act was passed forbidding British subjects to take part in it, either for supply of the conquered colonies or of foreign possessions. In the same year, a resolution moved by Fox for a total abolition next session was carried in the commons, and on Lord Granville's motion, adopted in the lords; and the following year, the general abolition bill, making all slave-trade illegal after 1808, Jan. 1, was introduced by Lord Howick (afterward Earl Grey) in the house of commons, was carried in both houses, and received the royal assent 1807, Mar. 25. British subjects, however, continued to

carry on the trade under cover of the Spanish and Portuguese flags; the slave-ships were more crowded than ever, from the necessity of avoiding capture, and the negroes were not unfrequently thrown overboard on a pursuit. The pecuniary penalties of the act were discovered to be inadequate to put down a traffic so lucrative as to cover all losses by capture. Brougham therefore, 1811, introduced a bill, which was carried unanimously, making the slave-trade felony, punishable with 14 years' transportation, or from three to five years' imprisonment with hard labor. An act of 1824 declared it piracy, and as such, a capital crime, if committed within the admiralty jurisdiction; and the statute of 1837, mitigating the criminal code, left it punishable with transportation for life. Among the philanthropic projects due to the exertions of the Anti-slavery Soc. was the establishment of the colony of Sierra Leone, on the coast of Africa, which had been formed by the Brit. govt. 1787, in order to show the possibility of obtaining colonial produce without slave-labor; and which, after the abolition of the slave-trade, became a settlement for the negroes captured by British cruisers.

The United States prohibited importation of slaves from Africa 1808; and the same was in the course of time done by the S. Amer. republics of Venezuela, Chili, and Buenos Ayres, by Sweden, Denmark, Holland, and during the Hundred Days after Napoleon's return from Elba, by France. Great Britain, at the peace, exerted her influence to induce other foreign powers to adopt a similar policy; and eventually nearly all the states of Europe have passed laws or entered into treaties prohibiting the traffic. The accession of Portugal and Spain to the principle of abolition was obtained by treaties of date 1815 and 17; and by a convention concluded with Brazil 1826, it was declared piratical for the subjects of that country to be engaged in the slave-trade after 1830. By the conventions with France of 1831 and 33, to which nearly all the maritime powers of Europe have since acceded, a mutual right of search was stipulated within certain seas, for suppressing this traffic. The provisions of these treaties were further extended 1841 by the Quintuple Treaty between the five great European powers, subsequently ratified by all of them except France. The Ashburton treaty of 1842 between Britain and the United States provided for maintenance by each country of a squadron on the African coast; and 1845 a joint co-operation of the naval forces of England and France was substituted for the mutual right of search.

The limitation of the supply of negroes naturally led, among other good results, to a greater attention on the part of the masters to the condition of their slaves. But the attention of philanthropists was next directed toward abolishing S. altogether. In England societies were formed with this end, an agitation was set on foot, and attempts were made, for some time without success, to press the subject of emancipation on the

house of commons. At length, 1833, a ministerial proposition for emancipation was introduced by Stanley, then colonial sec., and an emancipation bill passed both houses, and obtained the royal assent, 1833, Aug. 28. This act, while it gave freedom to the slaves throughout all the British colonies, at the same time awarded an indemnification to the slave-owners of £20,000,000. S. was to cease 1834, Aug. 1, but the slaves were for a certain time to be apprenticed laborers to their former owners. Objections being raised to the apprenticeship, its duration was shortened, and the complete enfranchisement took place 1838.

The French emancipated their negroes 1848; as did most of the new republics of S. America at the time of the revolution; while the Dutch slaves had freedom conferred on them 1863. In Hayti, S. ceased as far back as 1791, its abolition having been one of the results of the negro insurrection of that year. In Portugal it was enacted 1858 that all slaves belonging to Portuguese subjects should be free after 20 yrs.: hence, since 1878 S. has been illegal throughout all the Portuguese provinces. Many of the Spanish Amer. states abolished S. on declaring their independence; the rest have since that time abolished the institution. In Brazil a law of gradual emancipation was passed 1871, freeing all children born after that date, though holding children born of slave women to be apprentices of their mothers' owners for 21 years.—A treaty between Great Britain and the Sultan of Zanzibar secures, in promise, the speedy abolition of the slave-trade on the opposite e. coast of Africa. The expedition of Sir Samuel Baker, 1873, was announced as having ended the slave-trade s. of Egypt as far as the equator. How far the khedive was sincere in coupling this object with the conquest of the Nile regions is doubtful; and it is certain that most of his officers and an army of slave-hunters are bent on defeating the attempt.

Slavery in the United States.—In presence of the famous statement in the Declaration of Independence, that 'all men are born free and equal, and possess equal and inalienable rights to life, liberty, and the pursuit of happiness,' the colonies which threw off the British yoke and became the United States contained several hundred thousand negro slaves, whose condition of S. was expressly recognized in the constitution of the United States as ratified 1788—by a provision for rendition of fugitive slaves. The regulation of this particular subject was delegated to the federal govt., S. being otherwise left to be governed by the laws of the states where it existed (see CONSTITUTION OF THE UNITED STATES—Art. IV., Sec. 2). S. established itself firmly in the southern states, where negro labor was required for cultivation of sugar and cotton, while it declined in the northern states, where it was not needed, and was even unprofitable; and after the limitation of the supply from Africa. the breeding of slaves went on

to a large extent in Md. and Va. for supply of the other states of the south. The different position of the northern and southern states regarding slavery combined, with other causes, to engender that diversity of feeling and interest between north and south out of which arose the civil war.

S. was from the beginning recognized as an evil to be abated: the leaders of public opinion—Washington, Franklin, Hamilton, Jefferson, etc., deemed it inconsistent with the principles of free government. An abolition soc. was founded in Penn. 1775, with Benjamin Franklin as its pres.; and similar organizations soon arose in Mass., Conn., R. I., Del., Md., and Va. A determined and aggressive agitation against the continuance of the institution was begun 1831 under the leadership of Garrison (q.v.), Wendell Phillips (q.v.), Arthur Tappan (q.v.), Lewis Tappan (q.v.), and many others (see various biographical titles), who declared slaveholding 'a sin against God and a crime against humanity.' The liberty party, the free soil party, and finally the republican party were doubtless inspired by the principles of human freedom proclaimed by these leaders; though neither the free soil party nor the republican party was in any sense committed to the policy of abolition. Many among them hoped for its abolition; but the principle of the party, as concerned S., was to *prevent its extension* as a political power perilous to the union of the states. The increased consumption of cotton had led to an increased demand for slave labor; and 1820, when Missouri was admitted to the Union as a slave state, a compromise was entered into by which slavery was legalized southward, but prohibited northward of 36° 30′ n. lat.: see MASON AND DIXON'S LINE: COMPROMISE MEASURES OF 1850: MISSOURI—*History*. California, though partly lying s. of this geographical line, was admitted as a free state, the southern party obtaining in compensation the boon of an amendment of the Fugitive Slave Law, making it penal to harbor runaway slaves or aid in their escape. A belated moral awakening, accompanied by a reaction against the extreme and dictatorial policy of the south, taking distinct political form in Lincoln's election as president, was the signal for a long-threatened secession of the southern states, and for the bloody war which ended in the overthrow of the principle of state-sovereignty and the consolidation of the Union, with S. totally eliminated. Even so late as the second year of the rebellion, 1862, Aug. 22, Pres. Lincoln wrote, 'My paramount object is to save the Union, and not either to save or destroy slavery.' When the abolition of S. appeared to be demanded in the interest of the Union and as a military measure hastening the downfall of the Confederate govt., Pres. Lincoln—having given warning by a preliminary proclamation—issued, 1863, Jan. 1, his Proclamation of Emancipation, as follows:

SLAVERY.

PROCLAMATION.

Whereas, On the 22d day of Sep., in the year of our Lord 1862, a proclamation was issued by the president of the United States, containing among other things the following, to wit:

That, on 1st day of Jan., in the year of our Lord 1863, all persons held as slaves within any state, or any designated part of a state, the people whereof shall then be in rebellion against the United States, shall be thenceforward and forever free, and the executive government of the United States, including the military and naval authority thereof, will recognize and maintain the freedom of such persons, and will do no act or acts to repress such persons, or any of them, in any efforts they may make for their actual freedom.

That, the executive will, on the 1st day of Jan. aforesaid, by proclamation, designate the states and parts of states, if any, in which the people thereof respectively shall then be in rebellion against the United States, and the fact that any state, or the people thereof, shall on that day be in good faith represented in the congress of the United States by members chosen thereto at elections wherein a majority of the qualified voters of such state shall have participated, shall, in the absence of strong countervailing testimony, be deemed conclusive evidence that such state and the people thereof are not then in rebellion against the United States.

Now, therefore, I, Abraham Lincoln, president of the United States, by virtue of the power in me vested, as commander-in-chief of the army and navy of the United States, in time of actual armed rebellion against the authority and government of the United States, and as a fit and necessary war-measure for repressing said rebellion, do, on the 1st day of Jan., in the year of our Lord 1863, and in accordance with my purpose so to do, publicly proclaim for the full period of 100 days from the day of the first above-mentioned order, and designate as the states and parts of states wherein the people thereof respectively are this day in rebellion against the United States, the following, to wit: Arkansas, Texas, Louisiana, except the parishes of St. Bernard, Plaquemines, Jefferson, St. John, St. Charles, St. James, Ascension, Assumption, Terre Bonne, Lafourche, St. Mary, St. Martin, and Orleans, including the city of New Orleans, Mississippi, Alabama, Florida, Georgia, South Carolina, North Carolina, and Virginia, except the 48 counties designated as West Virginia, and also the counties of Berkeley, Accomac, Northampton, Elizabeth City, York, Princess Ann, and Norfolk, including the cities of Norfolk and Portsmouth, and which excepted parts are, for the present, left precisely as if this proclamation were not issued.

And by virtue of the power, and for the purpose aforesaid, I do order and declare that all persons held as slaves within said designated states and parts of states

are, and henceforward shall be, free; and that the executive government of the United States, including the military and naval authorities thereof, will recognize and maintain the freedom of said persons.

And I hereby enjoin upon the people so declared to be free, to abstain from all violence, unless in necessary self-defense, and I recommend to them, that in all cases, when allowed, they labor faithfully for reasonable wages.

And I further declare and make known that such persons of suitable condition will be received into the armed service of the United States to garrison forts, positions, stations, and other places, and to man vessels of all sorts in said service.

And upon this, sincerely believed to be an act of justice, warranted by the constitution, upon military necessity, I invoke the considerate judgment of mankind and the gracious favor of Almighty God.

In witness whereof, I have hereunto set my hand and caused the seal of the United States to be affixed.

[L.S.] Done at the city of Washington, this 1st day of January, in the year of our Lord 1863, and of the independence of the United States of America the 87th.

By the President: ABRAHAM LINCOLN.

WILLIAM H. SEWARD, Secretary of State.

The U. S. secretary of state proclaimed 1865, Dec. 18, the adoption by 27 out of the 36 states of a constitutional amendment (which had been voted in congress 1865, Jan.) forever prohibiting 'slavery and involuntary servitude' within the United States (see CONSTITUTION OF THE UNITED STATES—Art. XIII.).

Slavery no longer exists anywhere on the American continent, nor in the former Spanish colonies of Cuba and Porto Rico, now under the American flag. In Africa slavery and the slave trade still flourish except where those practices are repressed by European governments.

SLAVIC, n. *slăv'ĭk:* Slavonic. CHURCH SLAVIC, a name given to an ancient dialect of Bulgaria, from its being used as the sacred language of the Greek Church; called also Old Bulgarian.

SLAVONIA, *slă-vō'nĭ-a:* a territory of Austria-Hungary which, with Croatia, constitutes the kingdom of Croatia and Slavonia and forms part of the possessions of the Hungarian crown. It is bounded on the n.e. by Hungary, on the s. by Bosnia and part of Servia and on the w. by Croatia, and has an area of 3,640 sq.m., exclusive of that portion of the military frontier lying between Slavonia and Croatia, which may be regarded as falling within its limits. A branch of the Carmolan Alps, entering Slavonia from Croatia on the w., traverses it throughout its whole length, forming the watershed between the Drave on the n. and the Save to the s. The forests are very rich and cover the upper mountain sides,

on whose lower slopes cultivation is actively carried on. The valleys are extremely fertile; but there are large swamps created by the frequent inundations of the river, rendering the climate in parts extremely unhealthy. Agriculture is by far the most important occupation, the principal products being grain, fruit, flax, hemp and wine, and the leading exports grain, wine, fruit, cattle, lumber, and the celebrated *Sliwowitz* brandy, distilled from plums. The inhabitants are chiefly Serbs and profess for the greater part the Roman Catholic and the Greek Orthodox faith. The chief town is Eszek. With Croatia it has a national Landtag or Diet and sends representatives to the Hungarian parliament. The population of Croatia and Slavonia in 1900 was 2,397,249.

As part of Illyricum, Slavonia was acquired by the Romans in the reign of Augustus and was incorporated with the province of Pannonia. From the Byzantines it was wrested in the 5th and 6th centuries by the invading Slavic tribes, from which time dates its close union with the country to the w., which came to be known as Croatia. The united state was ruled by princes of the Hungarian royal house till the early part of the 16th c., when Slavonia was overrun by the Turks. They were driven out at the end of the following century and the territory was organized on a military basis for the defense of the Austrian frontier. Part of Slavonia was placed under civil adminstration in 1745, but the Military Frontier was not done away with till 1873.

SLAVONIC, a. *slă-vŏn'ĭk,* or SLAVONIAN, a. *slă-vō'-nĭ-ăn:* pertaining to the Slavs or Slavonians; spelled also SCLAVON'IC and SCLAVO'NIAN. See SLAVS.

SLAVS, *slavz:* the general designation for a group of peoples inhabiting eastern and central Europe and forming one of the most important branches of the Indo-European family of nations. The name is derived from the native term *Slovenia,* the origin of which is obscure, some connecting it with *slovo,* word, speech, and others with *slava,* fame. In support of the former etymology is the fact that the Slavic term for foreigner is *nientsy,* dumb, as marking the differentiation between those whose speech was intelligible to the Slav ear, that is, the Slavs themselves, and those who made use of an incomprehensible tongue. The connection between Slav and slave, though supported by the analogy of *servus* and Serb, is nevertheless merely fanciful. The slavic group comprises the following nationalities: Russians therein included the Great Russians, the Little Russians, and the White Russians, Bulgarians, Serbo-Croatians, Slovenians, Czechs, comprising the Bohemians, the Moravians and the Slovaks; Wends or Sorbs, consisting of the inhabitants of Upper and Lower Lusatia, and Poles with the allied Corsubians. The early history of the Slavs is veiled in obscurity, and only an approximate idea as to their original home is to be obtained. In Pliny and

Tacitus the name Venedæ (whence the modern Wenden) appears as the designation of a group of non-Germanic tribes living to the n.e. of the Carpathian Mountains and extending to the shores of the Baltic and the lake country of the Finns. Ptolemy in the 2d c. of our era gives a description of the peoples residing between the Vistula and the Don, which would undoubtedly tend to connect a part at least of these tribes with the Slav family. Roughly, the home of the Slavs in the first centuries after Christ may be given as extending from the Vistula and the Carpathians northeastward to the headwaters of the Volga and along that stream to its junction with the Oka, and southeastward to the Bug and Dnieper, comprising thus the southwestern third of the present Russian empire. South and s.e. of the Baltic, however, were the Lithuanians, a non-Slavic people, though nearest to the Slavs of all Indo-European stocks. In the 6th c. Procopius and Jardanes speak of two great Slavic nations, the Sclaveni and the Antes, as established on the left bank of the Danube and to the n. From this it would seem that in the 3d or 4th c. the Slav peoples began to migrate from their homes southward, and westward, under pressure probably of the Baltic tribes to the n. In the 5th c. they took possession of the country between the Vistula and the Elbe, left unoccupied by the southward migration of the Germanic Burgundians, Goths, Suevi, etc. About the same time Slav tribes entered Bohemia and Moravia, and others advancing from behind the Carpathians made themselves masters of western Hungary, whence they passed into Syria, Carinthia and Carinola. At the beginning of the 7th c. the Slavs on the Danube crossed into Mœsia and overran Thracia and Macedonia as well, and at the same time the Croats and the Serbs made their homes in the ancient Illyricum and Dalmatia. A second great wave of Slav migration starting from the original home n. of the Carpathians, spread e. and n., pushing the Finns before them. Under Scandinavian rulers these tribes became the nucleus of the Russian nation. Of this wide area of conquest they have lost in the process of time the regions of the Oder and the Elbe, Upper Austria and part of Carinthia and Styria, of all of which they were deprived by the Germans; large parts of Transylvania and Hungary which fell to Rumanians and Magyars; and parts of the regions s. of the Danube, which have passed to the Greeks and the Turks. The number of Slavs in Europe is estimated at about 120,000,000, of whom the great bulk, more than 85,000,000, reside within the limits of the Russian empire (Russians and Poles), the other nationalities in order of numerical strength being the Czechs-Slovaks and the Croatians in Austria-Hungary, the Bulgarians, under the suzerainty of Turkey, the Serbians, independent, the Bosnians and Herzegovinians, and the Montenegrins. (See the articles on the various countries mentioned.)

The ancient Slavs were almost exclusively an agricultural people, averse to war, and living in complete tribal independence under a fully developed patriarchal system, which at a later time became blended with a communal form of government. They were the latest of all the European peoples to enter the sphere of modern civilization, their religion and their literature being, as compared with the other nations, of recent date. The eastern branch of the Slavs received its civilization and religion from Byzantium, the western Slavs from Rome. Christianity made rapid headway among them in spite of the fact that they seem to have possessed a well developed nature-cult, about which, however, we possess no definite information. Our materials are limited to the names of various deities worshipped among the northern Slavs, while as to the mythology of the southern branches of the race even such data is wanting. Among the gods of the Russian Slavs were Pernu, identified by some with Thor, the northern God of Thunder; Dazbog (the Day God), Wolos, Stribog and others. Svintovint or Sviatovit was the great god of the Baltic Slavs (Rügen), and some who maintain that along with their idol-worship the Slavs possessed a belief in a supreme God, would assign to Svintovint that role. Grimm erects Svintovint, Pernu and a god named Radegast into a trinity, with functions corresponding to the classic Jupiter, Vulcan and Mercury respectively. Other deities worshipped by the Slavs were Prove, the god of justice; Rugevit, of war; Triglaw; Lado and Lada, divinities of order and love; Dievana (Diana), goddess of the woods, and Prija, the Scandinavian Freya. Among the Silesian Slavs the principles of light and darkness were typified by the Bielobog and the Czernobog, the White God and the Black God. The mythology of the Slavs was rich in deities of a lower order, in nymphs, naiads and mountain sprites, in goddesses of birth and fate, divinities of the hearth and the field, in evil demons and vampires. The forms of the Slavonic deities recall to mind those of India. Svintovint was represented as four-headed, Pernu as four-faced, etc. There is some testimony to a belief entertained by some of the Slavs in the immortality of the soul and a resurrection beyond the grave. Their principal celebrations were the *kobiada,* a feast held at the beginning of the year, when an interchange of presents was customary; the *kupalo,* a feast that took place in honor of the sun at the time of the summer solstice; and the *trizna,* celebrated in honor of the dead. The functions of priest and ruler were combined in the same person.

Languages.—The Slavic tongues have been the subject of much and varied classification. One widely accepted arrangement is as follows: (1) Bulgarian; (2) Serbo-Croatic; (3) Slovenian (2 and 3 sometimes being given as one group); (4) Russian, including Great Russian, Little Russian and White Russian; (5) Czechish, with

the closely related Slovak; (6) Sorb or Wendish; and (7) Polish, Bulgarian, Serbo-Croatian and Russian have sometimes been classified into a Southeastern Slav group as against a Western group consisting of all the others. To the latter group should be added the extinct Polabian. The oldest of the Slavic tongues is the old Church Slavic or Old Bulgarian, which is still the ritual language of the Greek Orthodox church in Russia, Bulgaria and Servia. The Slavic languages are marked by a richness of vowel sounds and a high degree of inflection, which in the noun gives us seven cases, and in the verb, in spite of a restricted number of tenses, a large number of modal and affective auxiliaries, rendering possible the finest distinctions of meaning. The so-called Cyrillian alphabet is made use of in Russian, Bulgarian and Serbian, but the Old Church Slavic makes use also of the Glagolitic alphabet (q.v.). The Polish, Croatian, Czech, Slovenian and Sorb employ the Roman characters.

Slavic Music.—Sentiment, which forms so prominent a trait in the Slav character, renders the members of that race peculiarly subject to the influence of music. In Russia the origins are found in the folk-songs, which were greatly influenced by the music of the Church. In the 17th c. western influences enter the country and especially the Italian, which lasted well into the 19th c., when we have the use of a national school with the appearance of Glinka. The prevailing characteristic of Russian music, whether classic or popular, is an all pervading tone of melancholy which has found its fullest expression, perhaps, in the works of Tschaikowsky. Polish music, in many respects resembling the Russian, differs from the latter in a greater vivacity of movement and spirit. The Bohemian is the third important national school of Slavic music and one which in recent years has surpassed the Polish in productivity and held its own with the Russian.

Panslavism.—This name has been given to the agitation carried on by a great party in Russia looking toward the union of the Slavic peoples of Europe under Russian rule. The movement originated about 1830, when the Polish revolution stirred the national consciousness of Russia to fever heat, and it received increased strength from the second Polish revolution in 1863. Outside of Russia the ideals of Panslavism have been favorably received by the Slavs in Bohemia, Silesia and Croatia-Slavonia where the members of that race feel their national existence threatened by the action of the government, Austrian, Hungarian or German as the case may be. The Panslavists in Russia have at the same time advocated the abandonment of the policy of Peter the Great which had for its object the reconstruction of the empire on Western models. They assert that the peculiar character of the Russian people renders it imperative that the development of the country proceed on national

lines, and attribute most of the political and social evils of the present time to the attempt to force the civilization of Western Europe with its features of democracy and capitalism upon a people like the Russians, whose nature, it is asserted, calls rather for the patriarchal form of government.

SLAY, v. *slā* [AS. *slean;* Goth. *slahan;* Icel. *sla;* Ger. *schlagen,* to smite]: to put to death by a weapon; to kill; to murder. SLAY'ING, imp. SLEW, pt. *slô,* did slay. SLAIN, pp. *slān.* SLAY'ER, n. *-ėr,* one who slays.—SYN. of 'slay': to kill; murder; massacre; assassinate; slaughter; butcher.

SLAY, or SLAIE, n. *slā:* a weaver's reed. See SLEY; SLEID.

SLEAVE, n. *slēv* [Dan. *slöife,* a slip-knot: Ger. *schleife,* a noose]: a tangled mass of fibrous matter; the knotted or entangled part of silk or thread; the refuse of the cocoon which cannot be wound off, but only spun: V. to separate threads; to sley. SLEAV'ING, imp. SLEAVED, pp. *slēvd:* ADJ. raw; unwrought.

SLEAZY, and SLEEZY, a. *slē'zĭ* [Ger. *schleissig,* worn out, threadbare; *schleissen,* to fray, to wear out]: wanting firmness of texture or substance; apt to fray or tear; thin; flimsy; weak.

SLED, n. *slĕd* [Dut. *slede;* Ger. *schlitten;* Dan. *slæde;* OHG. *slita;* Sw. *slede;* Icel. *sedli,* a sledge; Gael. *sload,* to trail along the ground, to drag; *slaod,* a sledge]: a carriage or wagon without wheels, and moving on slides, used for conveying loads over frozen snow and ice: V. to convey on sleds. SLED'DING, imp.: N. the act of transporting on a sled; the means of conveying on sleds. SLED'DED, pp.: ADJ. in *OE.,* mounted on a sled.

SLEDGE, n. *slĕj* [from SLED, which see]: a sort of carriage made to slide on ice or frozen snow, or to run on low wheels; a sleigh for riding on snow; same as SLED.

SLEDGE, n. *slĕj,* or SLEDGE-HAMMER [AS. *sleege;* Dan. *slægge;* Sw. *slägga,* a large smith's hammer: AS. *slean,* to strike: Ger. *schlag-hammer,* a sledge-hammer]: a large heavy hammer used by blacksmiths in beating out iron: V. to beat. SLEDG'ING, imp. SLEDGED, pp. *slĕjd.*

SLEE, n. *slē* [perhaps a corruption of *sleigh*]: in *ship-building,* a cradle placed beneath a ship when hauling her up for repairs.

SLEEK, a. *slēk* [Icel. *sleikja;* Dan. *slikke,* to lick, to stroke with the hands: Icel. *slikr,* sleek: Gael. *sliob,* to lick: Dut. *slijpen,* to polish; *slijk,* grease]: having an even, smooth surface; smooth and glossy; soft: V. to make smooth; to render smooth or soft. SLEEK'ING, imp. SLEEKED, pp. *slēkt.* SLEEKIT, a. *slēk'ĭt,* in *Scot.,* glossy; flattering but deceitful. SLEEK'LY, ad. *-lĭ,* smoothly; glossily. SLEEK'NESS, n. *-nĕs,* the state or quality of being sleek; smoothness and glossiness of surface. SLEEK'Y, a. *-ĭ,* of a sleek or smooth appearance.

SLEEP, n. *slēp* [Goth. *slepan;* Ger. *schlafen;* Dut. *slapen,* to sleep: OGH. *slaf,* drowsiness: Icel. *slapa,* to hang loose]: one of the normal conditions of the body, in which the voluntary exercise of the powers of body and mind is suspended; slumber; repose: V. to take rest in sleep; to slumber; to repose; to be inattentive; to live thoughtlessly; to be unnoticed or unagitated, as a subject or question; in *Scrip.,* to rest in the grave. SLEEP'ING, imp.: ADJ. reposing in sleep; resting; dormant, or not acting: N. state of being at rest. SLEPT, pt. and pp. *slĕpt.* SLEEPER, n. *slēp'ĕr,* one who sleeps; a lazy person. SLEEP'Y, a. *-ĭ,* drowsy; heavy. SLEEP'ILY, ad. *-ĭ-lĭ,* drowsily; with desire to sleep; lazily. SLEEP'INESS, n. *-nĕs,* drowsiness. SLEEP'LESS, a. *-lĕs,* having no sleep; wakeful. SLEEP'LESSLY, ad. *-lĭ.* SLEEP'LESSNESS, n. *-nĕs,* the state of being sleepless. SLEEP-WALKER, one who acts and walks in sleep. SLEEP-WALKING, the practice of walking in sleep; somnambulism. SLEEP LIKE A TOP, to sleep soundly and quietly. SYN. of 'sleep, v.': to slumber; rest; doze; repose;—of 'sleepy': dull; drowsy; sluggish; inactive; soporiferous; somniferous; lazy; heavy.

SLEEP: 'sleep is a condition in which consciousness is normally lost and in which the whole body, but particularly the brain, enjoys functional rest, while the constructive and nutritive activity goes on.'—Dana. During sleep the higher cerebral functions subside. Other organs, particularly the muscular system, rest at the same time. The brain is slightly anæmic. This anæmia is not to be regarded as the cause, but a condition or a part of sleep. The remote cause is probably inherent in the tissues themselves. They suffer a loss of energy producing substance during activity and this is restored to them during sleep. The exhausted tissues fall in irritability and they are further benumbed by the circulation of waste products in the blood. In sleep repair exceeds wear and the elimination of waste products from the blood goes on faster than they are developed. The various centers in the nervous system form a hierarchy with those of the cerebrum at the top and those of the medulla at the bottom. The basis upon which the hierarchy is formed is that of the regular periodicity of their activities. The lowest centers act with slight variation in the recurrence of activity. The waste suffered by any activity is completely made good in the following moment of rest. Not so with the highest centers. Their activities recur more or less regularly for a time, when they must cease altogether to allow repair to equal waste. They may then act for a time or until they reach a given stage of exhaustion. A longer periodicity is thus imposed upon the shorter. Sleep is a still longer periodicity imposed upon the highest centers in their activities. The amount of sleep required by people at different ages varies considerably. New-born babies sleep most of the time for

some weeks and adults require from six to eight hours. Different temperaments seem to require different amounts of sleep, the phlegmatic sleeping more as a rule than the nervous. The disturbances of sleep are many and varied. Dreaming is perhaps the commonest. When dreaming occurs, sleep is incomplete. In dreams the lower motor centers are completely inactive, while the higher centers of the cerebrum are most active, giving rise to a series of mental images. Nightmare is the name given to the extreme form of this condition, when the mental imagery is colored with unpleasant feelings and there is a complete paralysis of the voluntary powers. In somnambulism these conditions are almost reversed; the motor centers are often very active and the individual performs many complex acts of waking life. The sense of self and of its relations to the surroundings is in entire abeyance. Catalepsy and lethargy may be regarded as degrees of pathological sleep. Insomnia is the gravest of all disorders of sleep. Complete insomnia is a rare condition and the life of the patient cannot be maintained beyond three weeks in the absence of all sleep. Partial insomnia is a very common condition and one often fraught with serious consequences to the patient. Its chief causes are an irritable and neuropathic constitution, habit insomnia, certain heart and vascular diseases, euræmia, gout, simple exhaustion, tea, coffee, lead, tobacco, syphilis, etc. In some cases the toxine acts apparently upon the nervous tissues, producing a mental state incompatible with sleep, and in other cases the toxine produces physical symptoms which are of themselves capable of producing sleeplessness. These conditions are high arterial pressure and a rapid pulse. In health the arterial pressure is lower in the evening than in the morning. During natural sleep the arterial pressure falls only to rise again upon waking.

SLEEPING SICKNESS: a disease affecting formerly the natives of West Africa only, but now attacking those of the Congo Free State, and of Uganda and other countries of East Africa. The chief symptoms are headache, muscular tremor passing on into spasms or paralysis, indifference to the surroundings, a feeling of lassitude and disinclination to move, terminating finally in lethargy of mind and body, with drowsiness and almost constant dozing. There is but slight fever. Death invariably occurs, in the absence of proper treatment, at the end of from three months to as many years. The disease consists in an infiltration of small cells in the tissues surrounding the lymphatic vessels, and this, in the brain and spinal cord, results in an inflammation of the nervous matter and of the membranes surrounding it. The disease is caused by the presence of a microscopic animal parasite, a trypanosome, in the blood. This is carried from the sick to the well by a species of biting fly, *Glossina palpalis*. Formerly no treatment was of any

avail, the disease running a steadily progressive and uncontrollable course to its fatal termination, but of late it has been found that atoxyl, an arsenical preparation, acts with practically the same certainty in this disease as quinine does in malaria.

SLEEP OF PLANTS: one of the phenomena of irritability in plants. Light acts on plants as a powerful stimulus, essential to their active and healthful vegetation. When light is withdrawn, the flowers of many plants close, and the greater number show a tendency to it, while leaves more or less decidedly incline to fold themselves up. The leaf-stalk also generally hangs down more or less, though in some plants it is more erect during sleep. The sleep of plants, however, is not always nocturnal: the flowers of some open and close at particular hours of the day. Thus, the crocus is a morning flower, closing soon after midday; while some flowers expand only in the evening or during the night. Their hours of vegetative rest are probably as essential to the health of plants as those of sleep to animals. Linnæus first observed the sleep of plants, in watching the progress of some plants of *lotus,* whose seeds he had sown.

SLEEPY HOLLOW: the valley of the Pocantico creek, half a mile n. of Tarrytown, Westchester co., N. Y. It is best known as the scene of Washington Irving's *Legend of Sleepy Hollow,* in which he so vividly describes the quiet scenery of the valley and the quaint customs of the old Dutch settlers. The Dutch church, built in 1699, and the old mill conspicuous in the *Legend* are both standing; and in the newer part of the churchyard cemetery is Washington Irving's grave. Near the mill is the old Philipse Mansion. Above the cemetery rises a knoll, which in 1779 was fortified by the Continentals, but was never attacked.

SLEET, n. *slēt* [Icel. *sletta,* to splash: Norw. *sletta,* to fling: Dan. *slud;* Lap. *slatte,* sleet]: rain mingled with snow or hail: V. to rain with mingled snow or hail. SLEET'ING, imp. SLEET'ED, pp. SLEET'Y, a. *-ĭ,* consisting of sleet. SLEET'INESS, n. state of being sleety.

SLEEVE, n. *slēv* [AS. *slefe* or *slyf;* Fris. *slief,* what one slips the arm into: Bav. *schlaiffen,* to slip, as a bird its head under its wing: O.Dut. *sleve,* a sleeve: Fris. *slupe,* a pillow-slip]: the part of a coat or other garment made to cover the arm; in *mechanics,* a receiving-tube for a rod or other tube: V. to furnish with sleeves. SLEEV'ING, imp. SLEEVED, pp. *slēvd:* ADJ. having sleeves. SLEEVE'LESS, a. *-lĕs,* having no sleeves. SLEEVE-LINK, a clasp or fastener for sleeves. TO WEAR THE HEART UPON THE SLEEVE, to allow one's thoughts on any subject to become well known. TO LAUGH IN ONE'S SLEEVE, to laugh privately or unperceived—that is, behind the sleeve, which was formerly worn long and pendent. TO HANG ON or PIN TO THE SLEEVE, to be or to make dependent on others.

SLEEVELESS, a. *slēv'lĕs* [Icel. *sliofr;* Dan. *slöv*, dull, inactive, blunt: comp. Scot. *thieveless*, unprofitable]: wanting reasonableness or pretext; bootless; fruitless, as a *sleeveless errand;* random; unmeaning. *Note.*—Mr. Skeat suggests that the phrase *sleeveless errand* refers to the herald's tabard, which had *no sleeves,* adding that heralds' messages were frequently profitless in their results.

SLEID, v. *slād* [from SLEY, which see]: to prepare for use in the weaver's sley. SLEID'ING, imp. SLEID'ED, pp.: ADJ. prepared for the sley; prepared for weaving.

SLEIGH, n. *slā* [a variation of SLED, which see: comp. Gael. *slighe*, a way, a journey]: in *N. Amer.*, a carriage or wagon on runners for travelling over ice or frozen snow: V. to travel in a sleigh. SLEIGHING, imp. *slā'ĭng:* N. act of riding in a sleigh; the state of the snow which admits of running sleighs. SLEIGHED, pp. *slād:* also SLED and SLEDGE.

SLEIGHT, n. *slīt* [Icel. *slægr*, crafty: Sw. *slög*, dexterous, expert: Ger. *schlau*, cunning, sly; *schlich*, artifice: comp. Gael. *slaight*, roguery—allied to SLY]: a trick or feat so dexterously performed that the manner of doing it escapes observation; dexterous practice; dexterity. SLEIGHT OF HAND, legerdemain.

SLEMMER, *slĕm'ĕr*, ADAM J.: soldier: 1828–1868, Oct. 7.; b. Montgomery co., Penn. He graduated from West Point 1850; served in the Seminole war 1850–1, and on the Cal. frontier 1851–54; and taught in the U. S. Milit. Acad. 1855–59. He commanded troops in Fla. 1860–1, and by promptly occupying Fort Pickens saved that post to the Union. He took part in the siege of Corinth, and in the movements to Louisville and the relief of Nashville; and distinguished himself at Murfreesboro, where he was severely wounded. He was pres. of an examining board 1863, July—1865; and 1865 till his death was on duty at Fort Laramie, Kansas.

SLENDER, a. *slĕn'dĕr* [O. Dut. *slinder*, thin, small: Bav. *schlenderling*, something dangling]: slim; thin; small in circumference compared with the length; slight; limited; inadequate. SLEN'DERLY, ad. *-lĭ*, without bulk; slightly; meanly. SLEN'DERNESS, n. *-nĕs*, the state or quality of being slender; weakness; slightness; spareness; want of plenty; insufficiency.—SYN. of 'slender': thin; slight; slim; fine; narrow; weak; feeble; inconsiderable; moderate; trivial; small; meagre; inadequate; spare; simple; abstemious

SLEPT, v. *slĕpt:* pt. pp. of SLEEP, which see.

SLESVIG, *slĕs'vĭch* (Ger. SCHLESWIG, *shlĕs'vĭch*): duchy known till the 14th c. as South Jutland; formed part of the Danish dominions till 1864, when it fell into the hands of the Austrian and Prussian sovereigns. In terms of the treaty of 1867, it was incorporated with Prussia. Pop. (1864) 406,486; (1900) 1,387,968. Within its old recognized limits, it was bounded n. by Jutland; e. by the Little Belt and the Baltic; w. by the German Ocean; s. by Holstein,

from which it was divided by the Eider and the Kiel canal; 3,492 sq. m. The country consists in its e. and central parts of a gently undulating plain, deeply indented with fiords and streams; and on its w. boundary of flat marshy tracts of ground, which require protection from encroachment of the sea by numerous dams.

The numerous islands which skirt the w. coast of S. have probably, at some not very remote period, formed part of the mainland; for navigation is so seriously impeded by the sand-banks, that this coast is now accessible for ships by only three passages. The cluster of small islands, the Halligers, which lie, unprotected by dams, in the midst of these submerged sand-tracts, are so constantly exposed to the action of waves and storms, that the inhabitants are compelled to build their houses on piles. Off the e. coast of S. are the islands of Alsen, Aroe, and Femern—where the principal bays and inlets are the Haderslev and Aabenrade Fiords, opening into the Little Belt; the Flensborg Fiord, the Slie, the Eckernforde Fiord, and the Kieler Fiord, ancient boundary between S. and Holstein on the s.e , while the Eider completed it on the s.w. The principal branches of industry are agriculture, rearing of cattle, fishing, and ship-building. The Slie is the chief seat of the herring and salmon fisheries, which, though still important, are far inferior to those of the middle ages, when, according to the Danish historian Saxo-Grammaticus, herrings were so plentiful in the Belts and Cattegat, that they could be caught with the bare hands. The chief towns of S. are Flensborg (q.v.) Slesvig, now cap. of the Prussian province of Schleswig-Holstein (q.v.), a very ancient city, formerly the key of Denmark (pop. about 16,000): see SCHLESWIG; Haderslev, Husum, and Tonder. In the s., and partly in Holstein, is Rendsborg (pop. 13,000). S. has 800 schools. The pop. of the former duchy is mixed: rather more than half speak Danish; of the remainder, about 30,000 persons who belong to the islands on the w. coast, formerly part of the old province of N. Friesland, still use the Frisic language, the rest of the inhabitants using either Low or High German. The original Danish element of S. has remained purest in the n. half of the old duchy; while in the s. parts, where the inhabitants are naturally brought much in contact with Holstein, they have of late years adopted the views, tastes, and language of their German neighbors. The Lutheran is the established religion.

In accordance with the conditions stipulated in the treaty of Vienna, 1864, Aug., by which the duchies of Holstein and S. were ceded to Austria and Prussia, the island of Aroe and other districts of S., about 115 sq. m., were to be reunited to Denmark; while the latter power was to give in exchange a territory of about 130 sq. m., which, though within the boundary of S., had hitherto been under the jurisdiction of Jutland.

S., which forms part of the ancient Cimbrian Peninsula, has from the earliest period been a debatable land between Danes and Germans; and according to German authorities,

it was anciently included in the Marches of the empire, having been incorporated by Henry the Fowler 930, and reorganized by Otho I., when 948 the latter erected bishops' sees in Aarhuus, Ribe, and Slesvig. In 1027 the Danish king Knud (Eng. Canute) obtained from Conrad II. the recognition of the independence of S., which was declared to belong unconditionally to Denmark, and thenceforth given as a Danish fief of the crown to the younger sons of the regal house. In 1232 King Valdemar Seir, whose father, Prince Knud Laward, had ruled ably over the duchy, gave S.—then, and for some time later, known as S. Jutland—to his younger son Abel. The exact terms of the donation became a subject of dispute during the successive reigns of Valdemar's sons, Eric, Abel, and Christopher; and began the long course of civil wars and family feuds associated with this much-contested territory. After an interminable series of conflicts (of which see brief outline in DENMARK—*History:* GERMANY—*North German Confederation:* ETC.) came the outbreak in 1848, when, by the influence of the neighboring Holstein nobles, the Germanized great landed proprietors of S. entered on the course of armed opposition to the mother country, Denmark, which culminated in the forcible separation—by an Austro-Prussian army—of the duchy of S. from the Danish crown, completed in a conference at Vienna 1864, Aug. Ultimately, a dispute between Austria and Prussia as to the status of the two duchies S. and Holstein was made a prextext for the Austro-Prussian war of 1866; ending in the treaty of 1867, by which Austria abandoned her claims in favor of Prussia, but stipulated that a part of S. should be restored to Denmark. This stipulation, however, has never been carried into effect: the old duchy of S., with Holstein, has been incorporated as a province of Prussia in the German empire: see SCHLESWIG-HOLSTEIN: also HOLSTEIN.

SLEUTH, n. *slôth* [Icel. *slód*, a trail in the snow: Gael. *sluod*, to trail along the ground (see SLOT 1)]: in *Scot.*, the track of a man or beast, as known by the scent. SLEUTH-HOUND, a blood-hound which tracks by scent.

SLEW, v. *slô:* pt. of SLAY, which see.

SLEW, v., or SLUE, v. *slô* [origin uncertain: Scot. *slewyt*, slipped]: to turn round, as a mast or boom about its axis, without removing it from its place; to turn round about. SLEW'ING, or SLU'ING, imp: N. in *mil.*, the turning of a gun or mortar on its axis without moving it from the spot on which it rests; the turning horizontally upon a pivot. SLEWED, or SLUED, pp. *slôd:* ADJ. in *slang*, intoxicated—a drunken man moving unsteadily, as a ship does when it *slews* or changes its tack.

SLEY, n. *slā* [AS. *slæ*, a sley]: a weaver's reed: V. to part threads and arrange them in the reed or sley. SLEY'ING, imp. SLEYED, pp. *slād*.

SLICE, n. *slīs* [OF. *esclice*, a splinter; *esclier*, to split, OHG. *slizan*, to slit: Ger. *schleissen*, to split: Icel. *slita*, to tear asunder (see SLIT)]: a thin broad piece cut off; a broad piece; a broad plate with a handle for spreading plasters; a spatula: V. to cut into thin broad pieces; to cut into parts; to divide. SLI'CING, imp. SLICED, pp. *slīst:* ADJ. cut into broad thin pieces. SLICER, n. *slī'sėr*, a broad flat knife. SLI'CES, n. plu. *-sĕz*, wedges of small angle driven immediately before launching under the shores, by which the ship is sustained on the shipway.

SLICH, or SLICK, n. *slĭk* [Low Ger. *slich;* Ger. *-schlich*, pounded and washed ore]: ore of a metal, particularly of gold, when pounded and prepared for working.

SLICK, a. *slĭk* [Dan. *slikke*, to lick: Icel. *slikja*, to sleek, to polish: the same word as SLEEK]: in *OE.*, sleek; polished; smooth.

SLICK, n. *slĭk* [Ger. *schlich*, pounded ore prepared for further working]: the ore of a metal, particularly of gold, crushed and pounded. SLICK'INGS, n. plu. *-ĭngz*, in *mining*, narrow veins of ore. SLICKENSIDES, n. plu. *slĭk'n-sīdz* [Eng. *slick*, and *side*]: among *Derbyshire miners*, a variety of galena or sulphide of lead, which has acquired a smooth and shining striated surface: in *geol.*, the smooth striated and often glazed surfaces of faults or fissures of rock. They are produced by friction of the two surfaces during some movement of the rock. S. are seen oftenest in rocks bearing veins of metal, but sometimes in non-metalliferous rocks. When the surface of the S. is coated with a film of galena, pyrites, etc., as is often the case, it may be polished for use as a mirror, hence the French name for S., *miroire*. It is often seen also on the surface of carbonaceous slates, having the appearance of a thin lustrous black enamel on the dingy mass.

SLICKER, n. *slĭk'ėr:* in *leather working*, a tool for removing inequalities from, and imparting a polish to, a surface.

SLID, v., SLIDDEN: see SLIDE.

SLIDDER, v. *slĭd dėr* [O. Dut. *slidderen*, to drag: W *llithr*, a slip, a slide]: in *OE.*, to slide with interruption. SLID'DERING, imp. SLID'DERED, pp. *-dėrd.* SLID'DERY, a. *-dėr-ĭ*, slippery.

SLIDE, v. *slīd* [O. Dut. *slidderen*, to slip or fall: W *llithr*, a slip, a slide: Sw. *sliddrig*, loose, flagging]: to move smoothly over a surface without leaving it; to move along the surface without walking; to pass smoothly along; to pass along silently and easily, as on ice; to pass silently and gradually from one state to another; to glide; to fall; to lapse; to thrust along: N. an even smooth course; a smooth and easy passage; ice prepared for sliding on; a miner's term for a minor slip or dislocation of the strata; the glass on which are mounted the pictures for display by means of a magic-lantern or similar instrument; in *music*, a grace consisting of two small notes moving by degrees. SLI'DING, imp.: ADJ. slipping along a smooth surface; passing

smoothly and easily; falling gradually: N. act of one who slides over ice; in *OE.*, transgression. SLI'DED, pp. SLID, pt. pp. *slĭd.* SLIDDEN, pp. *slĭd'n.* SLIDER, n. *slī'dĕr*, one who slides; the part of a machine or instr. that slides. SLIDE-RAIL, a contrivance for connecting a siding with the main line of a railway. SLIDE-REST, an all-important part of a planing-machine or lathe for insuring accuracy in the motion of the cutting-tool by holding and directing it. SLIDE-VALVE, in *locomotive engines*, the regulating-valve placed in the steam-chest to work over the steam-ports. SLIDING-KEEL, in a *small vessel*, a narrow oblong frame used to deepen the draught and sustain a ship against the force of a side wind. SLIDING-WAYS, in *ship-building*, two narrow inclined planes built strongly on the shipway, intended to form the tracks by which the cradle sustaining the vessel glides into the water.

SLIDELL, *slī-dĕl'*, JOHN: 1793–1871, July 29; b. New York: U. S. and Confederate official. He graduated at Columbia Coll. 1810; began practice of law in New Orleans 1819; served one year as dist. atty.; was in congress 1843–45; in Mexico 1845–47 as U. S. minister, but not received there; and in the U. S. senate 1861, leaving when La. seceded. The same year, he sailed from Havana on a Brit. ship, with James M. Mason, as Confederate commissioner to France was captured by Capt. Wilkes, imprisoned in Fort Warren, released 1862 on demand of the Brit. govt., and went to France. While his mission waited for success on England's movement, Napoleon III. secretly favored a loan to the Confederacy, and the building in France of cruisers and rams. The vessels were ostensibly countermanded and sold; one of them was bought from Denmark, but too late. S. remained in England.—See *France and the Confederate Navy*, by John Bigelow (New York 1888).

SLIDING RULE: instrument invented by the Rev. William Oughtred, English mathematician, for solving arithmetical problems mechanically; consisting of three pieces of wood, of which two are fastened together by slips of brass at sufficient distance from each other to permit of a third sliding between them. The best size is about 2 ft. long, 2 inches broad, ¼ inch thick. One side of the rule has the following scales marked on it in order: a line of tenths of inches, of equal parts divided into tenths and hundredths of ft.; three lines of numbers, each line consisting of the numbers from 1 to 10 twice repeated; a line of sine rhumbs (logarithmic sines of each quarter-point of the compass); a line of meridional parts; and a line of equal parts. Of these, two of the lines of numbers are on the middle piece or *slider*. On the other side are—two lines of *natural scales*, including sines, secants, tangents, equal parts, etc.; two lines of logarithmic sines, two lines of logarithmic tangents, a third line of logarithmic sines, and a line of versed sines. Of these, one line of logarithmic sines and one of tangents are on the slider. The scale in most common use is that of numbers, and a description of its mode of use illustrates the whole working of the instrument. It is necessary, however, to notice, as a preliminary

that the scale of numbers is not evenly divided, as in this case only addition and subtraction could be performed, but is divided in proportion, not to the numbers, but to their logarithms, so that 3, whose logarithm is very nearly the half of that of 10, stands almost half-way between 1 and 10; and similarly of the other numbers. All questions of numerical proportion can thus be easily worked by means of the line of numbers on the slider, and the adjacent and corresponding one on the fixed part of the rule. To find a fourth number proportional to three given numbers, we place the first term (on the slider) opposite to the second term (on the fixed scale); and opposite the third term (on the slider) is the fourth or number required (on the scale). Multiplication is performed by making 1 the first term of a proportion, and division by making it the second or third. The other scales marked on the rule are useful in solving trigonometrical, geographical, and nautical problems, and the results obtained are much more accurate than one at first sight would believe. Sliding rules of circular form are not in any way preferable to the ordinary straight form.

SLIDING SCALE: scale of prices, wages, imposts, etc. adjusted to fluctuations in the price of raw material, agricultural products, or manufactured goods: as when the wages of iron-workers are raised or lowered as the price of (e.g.) steel rails rises or falls.—See CORN LAWS.—The same S. S. is given sometimes to a Sliding Rule.

SLIGHT, a. *slīt* [Ger. *schlicht;* O. Dut. *slicht,* plain, even: Goth. *slaihts;* Icel. *slettr,* even, smooth: Dan. *slet,* flat, bad]: superficial; not thorough; not strong; not deep, as an impression; faint; small; inconsiderable; trifling; paltry; not done with effort; not forcible: N. a moderate degree of contempt, manifested by neglect or indifference; disregard; disdain: V. to disregard, as of no importance or unworthy of consideration; to neglect; in *OE.,* to throw carelessly; to overthrow: AD. slightly. SLIGHT'ING, imp. SLIGHT'ED, pp. SLIGHT'ER, n. one who slights or disregards. SLIGHT'LY, ad. *-lĭ,* in a slight manner; in a small degree; weakly; negligently; without regard; without force; scornfully. SLIGHT'NESS, n. *-nĕs,* the state or quality of being slight; want of force or strength; superficialness; negligence; want of attention. SLIGHT'INGLY, ad. *-lĭ,* with neglect; without respect.—SYN. of 'slight, a.': small; worthless; inconsiderable; weak; negligent; foolish; thin; trifling; unimportant; gentle; perishable; slender;—of 'slight, n.': neglect; disregard; inattention; contempt; disdain; scorn.

SLIGO, *slī'gō:* maritime county, province of Connaught, Ireland; bounded n. by the Atlantic and the Bay of Donegal, s. by Roscommon and Mayo, e. by Roscommon and Leitrim, w. by Mayo; 41 m. from e. to w., 38 m. from n. to s.; 461,796 acres, of which about 320,000 are under tillage or in pasture, and 140,000 uncultivated. The coastline is indented with numerous bays, and, except in the Bay of Sligo, dangerous for navigation. The surface rises gradually from the coast eastward as far as an elevated range

called Slieve Gamph and the Ox Mountains, whose highest point rises 1,800 ft. Sligo contains comparatively few and small lakes, but some are picturesque, especially Lough Arrow and Lough Gill. The county is traversed by a branch of the Midland Great Western railway, connecting the county town of Sligo (q.v.) with Dublin. The mineral products are copper, lead, iron, and manganese. The climate is variable, and—though with frequent rains—mild and healthful. The plain of Sligo is a deep rich loam; and in the s. portion of the county are large tracts of corn-land and pasturage. The land is now chiefly used for pasturage. The Sligo fishery district comprises 110 m. of coast. Pop. (1901) 84,083.

Sligo was anciently the seat of the O'Connors, and was the scene of many conflicts between the several branches of that family, whose domestic feuds facilitated the first inroads of the Anglo-Normans. The district contains many remains of the Celtic and of the Anglo-Norman period. Of the former, there is one very interesting called the Giant's Cairn, near Sligo; and there are many raths, cromlechs, and ancient caverns.

SLI'GO: chief town of the county of Sligo, Ireland; on the river Garrogue; 131 m. n.w. from Dublin. Sligo had its origin in the erection of a Dominican abbey in the 13th c. by Maurice Fitzgerald, Earl of Kildare, around which—and a castle also built by him—a town was gradually formed: in the reign of James I. it received a charter. The modern town stands within a bend of the river, chiefly on the left bank; is mostly well built, and contains several handsome public edifices. It has few manufactures, but considerable commerce. Exports are chiefly corn, flour, meal, butter, provisions, and yarn. Steamers ply regularly between Sligo and Glasgow, Liverpool, and Londonderry. The chief buildings are a Roman Catholic cathedral, town-hall, lunatic asylum, etc., also the abbey. Pop. about 12,000.

SLILY, SLINESS. See under SLY.

SLIM, a. *slĭm* [O.Dut. *slim*, crafty; *slimgast*, a sly fellow: Gael. *slim*, slender: Ger. *schlimm*, evil, unwell: Icel. *slæmr*, vile]: slender; unsubstantial; slight; trifling; small; weak; of small diameter or thickness compared to the height. SLIM'LY, ad. *-lĭ*. SLIM'NESS, n. *-nĕs*, the state of being slim; slenderness.

SLIME, n. *slīm* [Ger. *schleim, schlamm;* Icel. *slim;* Dut. *slijm*, slime: without the initial sibilant, AS. *lam;* Low Ger. *leem;* Ger. *lehm*, loam, clay: L. *limus*, mud]: glutinous mud; soft earth having an adhesive or sticky quality: V. to cover with slime; to make slippery. SLIMY, a. *slī'mĭ*, consisting of soft adhesive earth; viscous; overspread with slime; glutinous. SLI'MINESS, n. *-mĭ-nĕs*, the quality of being slimy; glutinous matter. SLIMES, n. plu. *slīmz*, mud containing metallic ores.

SLIMY MILDEW. See FUNGI.

SLINESS: see under SLY.

SLING, n. *slĭng* [AS. *slingan*, to sling: Sw. *slinga*, to twist: Dan. *slingre*, to reel, to roll like a ship: Dut. *slingeren*, to sling: Ger. *schlingen*, to twist]: weapon consisting of a short leather strap with a round hole in the middle, and two cords about three feet in length. A round pebble being hung in the leather by the cords, the cords are held firmly in the right hand, and swung rapidly round: when the stone has attained great speed, one string is disengaged, on which the stone flies off at a tangent, its initial velocity being the same as it had at the last moment of revolution, and far greater than could be imparted in mere throwing. The S. was much used in ancient war.—Also, a S. is a support hung from the neck or breast to hold up a wounded arm: a rope by which a cask or bale is swung in or out of a ship: a throw: a stroke: V. to throw with a sling; to throw; to cast; to hurl; to hang by a rope so as to be moved; to move by means of a rope. SLING'ING, imp. SLANG, pt. *slăng*, did sling. SLUNG, pt. pp. SLING'ER, n. one who slings; a soldier of former times armed with a sling.

SLINK, v. *slingk* [AS. *slincan*, to creep or crawl: Ger. *schleichen*, to slink: Dut. *sleyken*, to sneak, to slink: Sw. *slinka*, to dangle: Swiss, *schlenken*, to sway to and fro]: to creep away meanly; to steal away; to sneak; to miscarry, as a female beast: ADJ. produced prematurely, as the young of a beast: N. the young of a beast brought forth prematurely. SLINK'ING, imp. SLANK, pt. *slăngk*, or SLUNK, pt. *slŭngk*, did slink. SLINKED, pp. *slĭngkt*, or SLUNK, pp. *slŭngk*. SLINKS, n. plu. the skins of prematurely born lambs, calves, etc.

SLIP, v. *slĭp* [Sw. *slippa;* Icel. *sleppa*, to get loose from, to slip: Ger. *schlüpfen;* Low Ger. *slippen*, to slip away: AS. *slipan*, to slip]: to move or glide involuntarily on the surface with one or both feet; to cause to slide involuntarily; not to tread firmly; to slide or glide; to move or fall out of place; to omit; to creep by oversight, followed by *into*, as an error into a MS.; to sneak or move meanly out of a place; to depart secretly; to escape, as from the memory; to fall into an error or fault; to lose by negligence; to leave slyly; to convey secretly; to separate twigs from a tree; to let loose; to throw off; to miscarry, as a beast: N. act of slipping; a twig cut from a tree; a long narrow piece; a narrow pew; an unintentional error or fault; a secret or unexpected desertion; a kind of loose frock for females; a plain skirt for wearing under a thin dress: in a *dock-yard*, a sloping bank or smooth inclined place with solid foundation, on which a ship may be built or repaired, and from which it may easily slide into the water, or upon which it may be drawn on a sort of railway for repairs (see LAUNCH: SHIP-BUILDING): a leash or string in which a dog is held, which *slips* or becomes loose by relaxing the hand; in *printing*, a portion of a column of type, or of matter before being made up into pages, struck off by itself: a proof from a column of type; in *pottery*, a mixture of powdered clay and flint; the stuff found in the troughs

of grindstones on which edge-tools have been ground; in *geol.*, a familiar term for a fault or dislocation in strata, as if one portion had *slipped* away from the other; in *OE.*, a counterfeit piece of money formed of brass silvered. SLIP'PING, imp. SLIPPED, pp. *slĭpt.* SLIP'PER, n. *-pĕr*, one who or that which slips, as a *slipper* of hounds; a loose easy shoe for indoor wear: ADJ. in *OE.*, slippery; not firm. SLIP'PERED, a. *-pĕrd*, wearing a slipper; furnished with slippers. SLIP'PERY, a. *-pĕr-ĭ*, not affording firm footing; not easily held; not to be depended on; changeable; unstable; in *OE.*, unchaste. SLIP'PY, a. slippery; smooth: N. a free translation of Nivose, the fourth month of the French republican year. SLIP'PERINESS, n. *-ĭ-nĕs*, the state or quality of being slippery; smoothness; want of firm footing. SLIP-BOARD, a board sliding in grooves. SLIP-COAT-CHEESE, n. a rich variety of cheese, made from milk warm from the cow, and resembling butter, but white. SLIP-KNOT, a knot which can slip along the line or rope around which it is made. SLIPSHOD, a. wearing shoes down at the heels only slipped on; careless in manners or style; shuffling. TO SLIP ON, to put on rather hastily. TO LET SLIP, to loose from the slip or noose, as a hound. TO SLIP A CABLE, to let go the end of it—i.e., to loose it. SLIP-SLOP, n. *familiarly*, inferior, weak, or insipid liquor; weak writing or talking: ADJ. poor, weak, insipid. TO GIVE ONE THE SLIP, to steal off unperceived; to elude pursuit.—SYN. of 'slip, v.': to slide; glide; sneak; slink; escape; err; omit; cut; miscarry;—of 'slip, n.': error; mistake; fault; leash; escape; desertion; twig;—of 'slippery': smooth; glib uncertain; changeable; mutable; unstable.

SLIPPED, *slĭpt:* in heraldry, term of blazon applied to a leaf, branch, or flower which is represented with a stalk, and torn from the parent stem.

SLISH, n. *slĭsh:* OE. for SLASH, a cross-cut, as in the phrase *slish and slash*, representing the sound of a blow cutting through the air, or scissors closing sharply.

SLIT, n. *slĭt* [AS. *slitan*, to tear: Ger. *schleissen*, to slit, to split: Dan. *slide;* Sw. and Icel. *slita*, to tear asunder, to separate]: a long cut or narrow opening; a cleft: V. to cut lengthwise; to make a long cut in; to cut. SLIT'TING, imp. SLIT, pt. pp. *slĭt.* SLIT'TER, n. *-tĕr*, one who slits. SLITTING-MILL, a mill where iron bars or plates are cut into narrow slips, as nail-rods; a machine used by lapidaries for slicing stones.

SLITHER, v. *slĭth'ĕr* [O. Dut. *slidderen*, to slip, to slide: W. *llithr*, a slip, a slide (see SLIDE: SLIDDER: GLIDE)]: to move smoothly into or over; to slide; to slip or slidder.

SLIVEN, *slēv'ĕn*, or SLIVNO, *slēv'no*, or SELIMNIA, *sā-lĭm'nĭ-â*, or ISLEMNIYE, *ĭs-lĕm'nĭ-yē:* town in E. Roumelia, at the s. base of the Balkans, 750 ft. above the sea; the *Stlifanos* of Byzantine writers. It occupies an important strategic position between Adrianople and the Sliven; contains many mosques, four Christian churches, and a synagogue; and has manufactories of milit. clothing, silk goods, and red wine. Pop. (1888) 20,893; (1900) 24,548.

SLIVER, v. *slĭv'ẽr* or *slī'ver* [Dut. *schilfer*, a splinter: AS. *slifan*, to cleave, to split]: to cut or divide into long thin pieces: N. a long piece cut or rent off; a long continuous lap or twist of wool or cotton. SLI'VERING, imp. SLI'VERED, pp. *-verd.*

SLOANE, *slōn*, Sir HANS, M.D.: physician and naturalist: 1660, Apr. 16—1753, Jan. 11; b. Killyleagh, County Down, Ireland; of Scotch parentage, his father having been the chief of the Scottish colony settled in Ulster by James I. of Great Britain. He applied himself in boyhood to natural history and medicine. His apprenticeship to Stafforth, pupil of Stahl—and the acquaintance, subsequently ripening into close friendship, with Boyle and Ray, two of the most celebrated naturalists of their time—did much to encourage and advance him in his favorite studies. During a brief sojourn in France, he attended the lectures of Tournefort and Du Verney; obtained on his return, by the active support of Sydenham, a footing in London as a physician, and was elected a member of the Royal Society 1685, and of the Royal College of Physicians 1687; but in 1687, Sept., he accompanied Monk, Duke of Albemarle, to Jamaica, and investigated the botany of that and the adjoining islands. On his return, he became physician to Christ's Hospital (1694-1724), president of the College of Physicians (1719-35), secretary to the Royal Society (1693), foreign associate of the French Academy of Sciences (1708), and succeeded Sir Isaac Newton as president of the Royal Society 1727. He had been created a baronet (the first English medical man so honored), and physician-general to the army, 1716; and 1727 was appointed royal physician. By long perseverance, he formed a most extensive museum of natural history, a library of 50,000 vols., and 3,560 MSS., which he directed to be offered at his death to the nation for £20,000 (about one-fourth of its real value), and which formed the commencement of the British Museum. His great work was the *Natural History of Jamaica*, which book was the means of introducing into the Pharmacopœia a number of excellent drugs previously unknown.

SLOANE, RUSH RICHARD: American lawyer and capitalist: b. Sandusky, Ohio, 1828, Sept. 18. He early entered political life, was twice elected probate judge, was a delegate to the convention which organized the Republican party in 1856, and a prominent member of various political committees and conventions. He was conspicuous in the abolition movement and was prosecuted by the United States government in 1852 for having defended six runaway slaves, the only person prosecuted for that offense under the Fugitive Slave Act of 1850. He was appointed general agent of the postoffice department by President Lincoln in 1861, assisted in the organization of the 'Cassius M. Clay Brigade' for the protection of Washington in 1861, and served as one of its members. He was mayor of Sandusky 1879-81,

built the 'Big Four' railroad between Springfield and Columbus, Ohio, was railroad president for 10 years and is largely interested in various commercial enterprises.

SLOANE, *slōn*, THOMAS O'CONOR: inventor and scientific expert: b. New York City, 1851, Nov. 24. He was graduated from St. Francis Xavier's College, N. Y., 1869-1872 (A.B., A.M.); Columbia College, 1872-1876 (E.M., PH.D.); became professor of Natural Sciences, Seton Hall College, South Orange, N. J., and while in that position gave numerous scientific lectures and acted as expert in litigation about patents. He invented a self-recording photometer, the first instrument that ever recorded the illuminating power of gas mechanically on an index card; and in 1877 he promulgated a new process for determining the amount of sulphur in gas, which proved to be scientifically accurate. He was a member of the editorial staff of the *Plumber and Sanitary Engineer*, the *Scientific American*, and the *Youth's Companion;* and contributed many articles to scientific publications, including the *Encyclopedia Britannica, Catholic Encyclopedia, Mineral Industry of the United States*, etc., besides a number of scientific journals at home and abroad. The following are among his leading published works: *Home Experiments in Science* (1888); *Arithmetic of Electricity* (1891); *Electricity Simplified* (1891); *Standard Electrical Dictionary* (1892); *How to Become a Successful Electrician* (1894); *Liquid Air and the Liquefaction of Gases* (1899); *The Electrician's Handy Book* (1905). He has compiled and translated from other languages several important scientific works.

SLOAT, *slōt*, JOHN DRAKE: naval officer: 1780-1867, Nov. 28; b. Staten Island, N. Y. He entered the U. S. naval service as midshipman 1800, but was mustered out the following year. Again he entered the navy, as sailing-master 1812, and served till 1815 on the frigate *United States*, where he earned the thanks of congress and a silver medal for gallantry and skill in capturing the British frigate *Macedonian;* he was then promoted lieutenant. He served on the schooner *Grampus* in W. Indian waters, suppressing pirates 1823-25, in the mean time succeeding to the command of the *Grampus* 1824. Promoted successively to the grades of master-commandant and captain, he commanded the Pacific squadron 1844-46: at the beginning of the war with Mexico, he occupied San Francisco and other important points. He was placed on the reserve list 1855, and was retired 1861, but was promoted commodore 1862, and rear-admiral 1866.

SLO'CUM, HENRY WARNER: Union general in the civil war: b. Delphi, N. Y., 1827, Sep. 24; d. 1894, Apr. 14. After graduation at West Point 1852, he served in the Florida war, and was promoted 1st lieutenant, but resigned 1856, became a lawyer in Syracuse, N. Y., and was in the legislature 1859. He offered his services to

the government 1861, May 21, was made colonel of the 27th N. Y. vols., and was wounded at the first battle of Bull Run; but the next month, appointed brigadier-general, he commanded a brigade in Franklin's division, participated in McClellan's campaign 1862, and, on the transference of Franklin, took his place as division commander, May 15. Much was due to his efficency at Gaines's Mills, Malvern Hill, and other scenes of battle; and he was promoted major-general, rendering signal service at South Mountain, Antietam, Fredericksburg, Chancellorsville, and at Gettysburg, where he commanded the right wing, repelling Ewell. After this he was assigned to duty in the department of the Cumberland; and in 1864, the year following the capture of Vicksburg, commanded that district. In Aug. of that year, taking command of the 20th corps in place of Hooker, he led in the occupation of Atlanta, and maneuvered the right wing in Sherman's great march 'to Richmond' by way of Savannah, meeting all the requirements of his important part, until the war ended, short of Richmond, with Lee's surrender to Grant and Johnston's to Sherman. After the war, Gen. Slocum practiced law in Brooklyn, N. Y.; was appointed colonel in the regular army, 1866; was a presidential elector 1868; and was elected to congress 1868, 1870, and 1884. He was president of the board of city works in Brooklyn, and a commissioner of its bridge.

SLOE, n. *slō,* or SLOE-THORN, or BLACKTHORN [AS. *sla;* Scot. *slae,* the sloe: Dut. *slee;* Ger. *schlehe,* the sloe: O.Dut. *sleeuw,* tart], (*Prunus spinosa*): shrub of the same genus with the plum, and perhaps really of the same species with it and the bullace. It is generally a shrub 4-10 ft. high, sometimes becoming a small tree of 15-20 ft. It is much branched, and the branches terminate in spines. The youngest shoots are covered with fine down. The flowers are small, snow-white, and generally appear before the leaves. The fruit is ovate, or almost globose, pale blue with blackish bloom, and generally about the size of the largest peas. The sloe is abundant in thickets and borders of woods, and in arid places in Britain and almost all parts of Europe; and found in old gardens, or escaped therefrom, in the United States. The shoots make beautiful walking-sticks. Although spiny, the sloe is not suitable for hedges, as its roots spread and it encroaches on the fields. The bark is bitter, astringent, and tonic. The flowers with the calyx, are purgative, and are in some places much used in domestic medicine. The fruit, a small, sour, wild plum, is very austere.

SLOGAN, n. *slō'găn* or *slō'găn* [a corruption of Gael. *sluagh-ghairm,* an army-cry—from *sluagh,* a host, army; *gairm,* a cry, a shout]: in *Scot.,* a Highland war-cry, or gathering-cry; the watchword used by troops in the field.

SLOGGER, n. *slŏg ĕr* [also, *in U. S.*, SLUGGER]: a hard hitter: a second-class racing-boat at Cambridge, corresponding to the torpids at Oxford [university slang].

SLOID, or SLOYD, n. *sloyd* [Sw. *slöjd*, skill]: system of exercises in manual training, beginning with the simplest and leading on to the most complex, but embodied from the outset in attractive and useful articles.

SLOOP, n. *slōp* [O. Dut. *sloepe*, a light vessel or ship—from *sloepen*, to slip: F. *chaloupe*]: fore and-aft rigged vessel with one mast and a stationary or fixed bowsprit, differing but slightly from a Cutter (q.v.). In the yachting world the two types are approaching closer every year. In this country the S. being of less draught than a cutter, is generally provided with a centre-board; it carries a mainsail, gaff top sail, and one to three jibs. In former times the S. was used as a sea-going vessel, but is now practically confined to river and harbor work except in the case of fishing-smacks, among which sloops are still found. Sometimes square top-sails have been used. For some yachting contests, see CUTTER.—In the navy, S. is a ship of war in size between a corvette and a brig; recently the name has been applied to warships of 2,000 tons, carrying 12 to 22 heavy guns. The term sloop-of-war is quite indefinite as to rig, and is now practically becoming obsolete except as referring to vessels of the old sailing navy.

SLOP, n. *slŏp* [Dut. *slabben*, to lap: Lap. *slabbot*, to sprinkle: Fris. *slobben*, to splash—a word imitative of the sound of dashing water: Gael. and Ir. *slaib*, mire]: water carelessly spilled or thrown about; a dirty wet place; in the *plu.*, coarse or poor liquid food; the liquid food of an invalid; the waste dirty water of the house: V. to soil by allowing water or other liquid to fall upon. SLOP'PING, imp. SLOPPED, pp. *slŏpt*. SLOPPY, a. *slŏp'pĭ*, muddy; plashy; miry and wet. SLOP'PINESS, n. *-nĕs*, the state of being sloppy; muddiness. SLOP-BASIN, a basin or bowl for holding the dregs of cups.

SLOP, n. *slŏp* [Icel. *sloppr*, a wide outer dress: AS. *slype*, a slop: Fris. *slupe*, a pillow slip: Dut. *slobbe*, a pair of loose bagging breeches]: any loose outer dress; a smock-frock. SLOPS, n. plu. large loose trousers; drawers; cheap ready-made clothing; the clothing, etc. (in the Brit. navy, the bedding also), supplied to seamen from the ship's stores. SLOP-SHOP, a shop where cheap ready-made clothes are sold. SLOP-SELLER, one who sells cheap ready-made clothes. SLOP-WORK, the manufacture of cheap ready-made clothing.

SLOPE, n. *slōp* [AS. *slipan*, to slip: Dut. *slap*, slack: Icel. *slapa;* Norw. *slape*, to hang down]: an oblique direction; a surface inclining gradually downward; a declivity: V. to form with a slope; to form or cut so as to have a downward direction; to be inclined; in *slang*, to hurry off; to disappear; to decamp. SLO'PING, imp.: ADJ. inclining from a horizontal or level plane; oblique. SLOPED, pp. *slōpt*. SLO'PINGLY, ad. *-lĭ*.

SLOPPY: see under SLOP 1.

SLOSH: see SLUSH.

SLOT, n. *slŏt* [Icel. *slód*, a track, a path: Gael. *slaod*, to trail along the ground: Pol. *slad*, a trace: Scot. *sleuth*, a track by the scent]: the print of a stag's foot on the ground. SLOT-HOUNDS, or SLEUTH-HOUNDS, hounds that track man or game by scent.

SLOT, n. *slŏt* [Sw. *slutt*, a slope]: a hollow. THE SLOT OF A HILL, the depression or valley between two hills or ridges.

SLOT, n. *slŏt* [Dut. *slot*, a lock (see SLOATS)]: a piece of timber which connects or holds together larger pieces; a flat wooden bar; a hollow for the head of a bolt or the like to work in; a depression or mortise in a plate of metal, or a slit through it; in a *theatre*, a trap-door in the stage: V. to slit or groove. SLOT'TING, imp. SLOT'TED, pp. SLOTTING-MACHINE, machine-tool for cutting slots, mortises, or square grooves in metal. It is of great importance in mechanical engineering, and many very ingenious inventions have been made for facilitating the process. The principle is, however, very simple, and is the same in all. It consists of a cutting-tool, or chisel, held very firmly in an arm, which is pressed down and raised alternately. The tool is thus made to pare off a thin portion of the metal each time it descends, until it has cut a slot of sufficient size.—The 'Slot-drilling Machine' makes elongated slots by drilling.

SLOTH, n. *slōth* or *slŏth* [AS. *slæwth*—from *slæw*, lazy, slow: Dut. *sleeuw*, blunt (see SLOW)]: disinclination to action or labor; habitual indolence; laziness; idleness; slowness; tardiness; sluggishness; a S. Amer. quadruped, so called from its slow and laborious walking (see below). SLOTH'FUL, a. *-fŭl*, inactive; dull of motion; lazy. SLOTH'FULLY, ad. *-lĭ*. SLOTH'FULNESS, n. *-nĕs*, the state or quality of being slothful; the habit of idleness.—SYN. of 'slothful': idle; lazy; sluggish; inactive; indolent; inert.

SLOTH (*Bradypus*): genus of mammalia, of ord. *Edentata*, family *Tardigrada*. The name was given from observation of the very slow and awkward movements of the animals of this genus on the ground; but better acquaintance with their habits, and observation of their movements among the branches of trees, for which their conformation peculiarly adapts them, have shown it not appropriate nor descriptive. In like manner, Buffon's notion that they are creatures of imperfect organization, and doomed to a miserable existence, has been completely exploded. Their structure, like that of every other creature, is admirably adapted to their mode of life. They feed on the leaves, buds, and young shoots of trees, among whose branches they are born, and spend their whole life, rarely and unwillingly descending to the ground. They do not walk upon the branches, but cling beneath them, with the back downward. The fore-legs are much longer than the hinder ones, and are used for embracing a branch, or for drawing in the branches on whose foliage they are to feed; and both the fore and hind feet are furnished with very long, curved, and sharp claws, serving as strong hooks to clasp the branches from which they depend. The pelvis

is very wide; and the hind-legs, thus widely separated, also diverge from one another. The structure of the wrist and ankle joints is such that the palm or sole is turned toward the body, so that upon the ground the animal is compelled to rest on the side of the hind-foot, while the length of the fore-legs causes it to rest on the knee or elbow of them, struggling forward by a shuffling movement, and dragging itself along by stretching out the fore-legs alternately and hooking the claws into the ground, or grasping some object. But in a dense tropical forest, sloths generally find it easy to pass from the branches of one tree to those of another, often taking advantage of a time when branches are brought within their reach by the wind. Where the trees are more distant from each other, they will eat the whole foliage of a tree ere they descend from it. The hair of sloths is coarse and shaggy, of very peculiar texture, inelastic, and much like grass withered in

Three-toed Sloth (*Bradypus tridactylus*).

the sun, but affords excellent protection from insects, while it also gives them such an appearance that they are not readily observed except when in motion. The muzzle of sloths is short, and the tail is short. There are no incisor teeth, but sharp canine teeth, and eight molars in the upper, six in the lower jaw. The molars are cylindrical, penetrated by no laminæ of enamel, and adapted merely for crushing, not for grinding the food. For this, however, there is compensation in the stomach, which is somewhat imperfectly divided, by transverse ligatures, into four compartments, for the longer retention and more thorough digestion of the food, though there is no rumination. The female sloth produces only one young one at a birth, which clings to its mother till it becomes able to provide for itself. The voice of sloths is a low plaintive cry. Their chief enemies are large snakes, but against these they defend themselves by their powerful fore-legs and claws. A sloth has been known to grasp a dog round the neck and strangle it. There are very few species. One species has the fore-feet furnished with only two toes; the others have three. These, with other differences, have been made the ground of a recent division of the genus

into two. The TWO-TOED S., or UNAU (*Bradypus* or *Cholœpus didactylus*), is about two ft. in length, of uniform grayish-brown color, often with reddish tint. The best-known species of THREE-TOED S. is the AI (*Bradypus* or *Acheus tridactylus*), which is smaller than the Unau, has a more obtuse muzzle, and is generally brownish gray, slightly variegated with hairs of different tints, the head darker than the body. All the sloths belong to tropical America.

SLOUCH, n. *slowch* [Icel. *slakr*, slack; *slókr*, a dull, inactive person: Sw. *sloka*, to droop: Dan. *sluköret*, crestfallen—*lit.*, having hanging ears]: a hanging down; a depression of the head or other part of the body; an ungainly clownish gait: V. to cause to hang down, as a hat; to hang down; to have a downcast clownish look or manner. SLOUCH'ING, imp.: ADJ. hanging down; walking heavily and awkwardly. SLOUCHED, pp. *slowcht:* ADJ. made to hang down; depressed. SLOUCH-HAT, a limp hat with large brim. SLOUCH-SHOES, large easy shoes.

SLOUGH, n. *slow* [Gael. *sloc*, a pit, gutter, grave: Dut. *slocken;* Gael. *sluig*, to swallow, to engulf: Gael. *slugaid*, a deep miry place]: a deep muddy place in which one may be engulfed; a soft bog or marsh. SLOUGHY, a. *slow'ĭ*, boggy; miry.

SLOUGH, n. *slŭf* [Norw. *slo*, a covering: Icel. *slög*, what is thrown away in dressing fish: Dut. *sloof*, a husk]: the cast-off skin of a serpent or similar reptile; simply a serpent's skin; the dead structure of flesh that separates from a wound, or during mortification: V. to separate from the living parts of flesh in a sore; to peel or fall off. SLOUGH'ING, imp. SLOUGHED, pp. *slŭft*. SLOUGHY, a. *slŭf'ĭ*, resembling the dead matter which separates from flesh. To SLOUGH OFF, to separate from the living parts, as the dead part in mortification.

SLOUGH, *slow:* village and urban sanitary dist. in the county of Buckingham, England; 18 m. w. of London, by the Great Western railway; about 2 m. from Windsor; area 410 acres. On the road between S. and Windsor lived Sir William Herschel, and at the observatory which he erected here, in which was placed his great telescope, many of his important astronomical discoveries were made. —Pop. 5,500.

SLOVAKIAN, a. *slō-văk'ĭ-an* [Slavonian, *slovak*]: of or belonging to the Slovaks or their language: N. the language of the Slovaks. It is still spoken in parts of Moravia and Bohemia.

SLOVAKS, *slō-văks':* Slavic inhabitants of n. Hungary, who, in the 9th c., formed the nucleus of the great Moravian kingdom; but after the bloody battle of Presburg (907) were gradually subjugated by the Magyars, to whom even yet they bear no friendly feeling. The S., probably the closest representatives of the old Slavic type, are industrious; are of soft, pliant disposition; and are mostly Rom. Catholics. They travel in great numbers over Germany and Poland as pedlers. Their language is generally

considered to present an earlier form of Czech or Bohemian. Against the competition of the Magyar, German, Czech, and Moravian, the Slovak tongue has been unable to establish itself as a literary language. The S. have produced some poets of note—e.g., Holly, Sladkovié, Chalupka: a collection of their popular ballads, etc., was pub. by Schafarik at Pesth, 2 vols. 1823–27.—The S. number about 1,950,000.—See SLAVS.

SLOVAN, n. *slō'van* [etym. doubt.]: in *mining*, a gallery in a mine; a day level, especially applied to damp places.

SLOVEN, n. *slŭv'ĕn* [O. Dut. *slof*, an old slipper, a sloven: Ger. *schlaff*, slack, flagging: Low Ger. *sluf*, indolent, negligent: Swiss, *schluffen*, to lead an inactive thoughtless life]: a man negligent of cleanliness and neatness in dress; a man who is habitually careless of neatness and order—SLUT being the corresponding feminine term. SLOV'ENLY, a. *-lĭ*, untidy; wanting in neatness and order of dress: AD. in a careless manner. SLOV'ENLINESS, n. *-nĕs*, negligence of dress; habitual want of order and neatness. SLOV'ENRY, n. *-ĕn-rĭ*, in *OE.*, want of neatness.

SLOVENES, *slō-vēnz'*, or SLOVENIANS, *slō-vē'nĭ-anz:* branch of the name s. Slavonic stock to which Serbs and Croats belong; found mainly in Styria, Carinthia, Carniola, and adjoining parts of s. Austria. They are sometimes called *Winds* or *Wends*, though distinct from the Wends (q.v.) of n. and e. Germany. The language of the S., *Slovenish*, is allied to Servian, but exhibits an older form of Slavonic. The Bible was printed in Slovenish 1584. The S. number about 1,300,000.—See SLAVS.

SLOW, a. *slō* [AS. *slaw*, lazy, slow: Dut. *sleeuw*, *slee* blunt, ineffective: Bav. *schlew*, feeble: Icel. *sljór;* Dan. *slöv;* Sw. *slö*, blunt, dull]: not quick in motion; less speedy than usual, or than what might be expected; gradual; forbearing; not ready or prompt, as in speech; dilatory; inactive; dull, as in understanding; stupid; not lively; behind in time, as a clock: V. to slacken in speed; in *OE.*, to delay; to procrastinate. SLOW'LY, ad. *-lĭ*, not speedily; not soon; not early; not hastily; gradually; not readily; tardily. SLOW'NESS, n. *-nĕs*, the state or quality of being slow; want of speed or quick motion; want of readiness or promptness. SLOW COACH, *familiarly*, one who gets on but slowly; a dawdling inactive person.—SYN. of 'slow, a.': inert; sluggish; dilatory; late; lingering; tardy; dull; inactive.

SLOW-MATCH: combustible material, such as cotton, hemp, tow, etc., often dipped in a solution of nitrate of potash (saltpetre), and formed into a thin rope. It is used for exploding gunpowder in various ways, on account of its slow, steady way of burning—a sufficient length being taken to enable the operator to remove to a safe distance. It is no longer used for firing cannon.

SLOWS, n. plu. *slōz:* a disease prevalent in some of the western and southern states; milk-sickness.

SLOW-WORM n. *slō-wèrm* [AS. *slá-wyrm*, probably not from *slow*, from its motion; but from AS. *slean*, to smite—from its supposed venomous sting· also referred to Ger. *schleichen*, to creep, or Norw. *slöge*. from its slime]: the blind-worm, a small reptile, snake-like but not venomous.

SLOYD. see SLOID.

SLUBBER, v. *slŭb'bèr* [Dut. *slobberen;* Dan. *slubbre*, to sup up liquids: Low Ger. *slubbern*, to sup up liquids, to do a thing carelessly and superficially]. to do lazily and coarsely; to stain; to daub; to sully; to cover coarsely or carelessly. SLUB'BERING, imp.: ADJ. moving with hurry; acting imperfectly. SLUB'BERED, pp. *-bèrd*. TO SLUBBER OVER, to do a thing carelessly and superficially.

SLUB'BING: see SPINNING.

SLUD, n. *slŭd* [an abbreviation of *sludge*]: in *mining*, a term given to the water and mud mixed together which runs off in washing some minerals.

SLUDGE, n. *slŭj* [an imitative word (see SLUSH)]: soft mud; dirt mixed with water; mire; slush. SLUDG'ER, n. *-èr*, an instr. for boring in sludge or quicksand. SLUDG'Y, a. *-ĭ*, miry; slushy. SLUDGE-HOLE, the mud-hole in boilers of steam engines by means of which the sediment can be removed.

SLUE, v.: see SLEW 2.

SLUG, n. *slŭg* [Low Ger. *slukkern*, to shake to and fro; *slakk*, slack, loose: Dan. *slugöret*, having flagging ears: Icel. *slókr*, a dull inactive person: Lith. *slunkis*, a sluggard]: one who indulges in sloth; a slow, sleepy, lazy fellow; kind of snail without a shell, very destructive to plants (see below): an oval piece of metal used for the charge of a gun: in the plu. SLUGS, *slŭgz*, half-roasted ore: V. in *GE.*, to lie idle; to move slowly; to play the drone. SLUG'GING, imp. SLUGGED, pp. *slŭgd*. SLUG'GARD, n. *-gèrd*, a person habitually lazy: ADJ. lazy. SLUG'GISH, a. *-gĭsh*, idle; lazy; naturally given to indolence; having little or no power to move itself. SLUG'GISHLY, ad. *-lĭ*, lazily; slothfully. SLUG'GISHNESS, n. *-nĕs*, the state of being sluggish; natural or habitual indolence; want of power to move; slowness. SLUG-A-BED, one fond of lying long in bed; a late riser. SLUG'GARDIZE, v. *-dīz*, to make dronish or idle. SLUG'GARDIZING, imp. SLUG'GARDIZED, pp. *gär-dīzd*.—SYN. of 'sluggish': inactive; tardy; inert; idle lazy; slothful; dronish; indolent; drowsy; dull; slow, stupid; tame.

SLUG: gasteropodous mollusk, of families *Limacidæ* and *Arionidæ*, which are closely allied to the Snail family, *Helicidæ*, but have no external shell. There is, however, a rudimental shell, generally concealed within the mantle, placed over the respiratory cavity. The *Limacidæ* are diffused over the whole world. They commit great ravages among field and garden crops during moist weather. In frosts, they become dormant, taking shelter under clods and at the roots of plants. They lay eggs in clusters, in

moist places, often at the roots of grass. The eggs resemble small oval bags of jelly. The body is generally oval or oblong, elongated. The foot is not distinct from the body. There are four retractile tentacles; the eyes are at the tips of the longer pair. Slugs often climb trees in quest of decaying vegetable matter on which to feed; and let themselves down by means of mucous threads, for whose

Slugs.

1, Gray slug; 2, Black slug; 3, The same full-grown, and as it appears when at rest; 4, Its eggs.

formation there is a small aperture at the hinder end of the body. Of British species, one of the most common is the GRAY S. (*Limax agrestis*), of whitish ash color; another is the GREAT GRAY S. (*L. maximus* or *antiquorum*), largest British species; another is the BLACK S. (*L. ater*), often popularly called the Black Snail. The RED S. (*Agrion agrestis*) also is very plentiful. Careful gardeners often gather slugs by the aid of a lantern at night, and destroy them. They may be killed also by watering the ground with a weak solution of ammonia.—For the American species, see works by W. G. Binney, published by the Smithsonian Institution. One of the two huge Ariolimax of the Pacific coast (*A. Californicus*) was found alive in Iowa, by H. W. Parker, having been transported on cabbages brought from California. The large southern species has of late, 1890-1, been encountered in and around New York.—The name S. is applied also to some grubs and caterpillars; also to certain sea-animals.

SLUICE, n. *slôs* [Sw. *sluss;* Dut. *sluys;* Ger. *schleuse;* Swiss, *kluss;* F. *écluse*, a flood-gate: Dan. *sluse*, a lock in a canal: mid. L. *exclūsa*, a flood-gate—from L. *exclūsus*, shut off—from *ex*, off; *claudo*, I shut]: a gate for the purpose of excluding or regulating the flow of water in a river, a canal, etc.; a source of supply; that through which anything flows. V. to open, as a flood-gate; to overwhelm; to wet abundantly; to emit by flood-gates. SLUIC'ING, imp. SLUICED, pp. *slôst*. SLUICY, a. *slôs'ĭ*, falling in streams as from a sluice.

SLUM, n. *slŭm*, usually in pln. SLUMS, *slŭmz* [connected with Scot. *slump*, a marsh; as a verb, to sink in a mire or bog]: the low neighborhood or back streets of a city, containing a poor, degraded, and often vicious population, temporary sleeping places for vagrants.

SLUMBER, v. *slum'bĕr* [Ger. *schlummern;* Dut. *sluimeren*, to slumber: n. Eng. *sloom* or *slaum*, a gentle sleep or slumber: Sw. *slumra*, to slumber; *slumrig*, indolent, lazy]: to sleep lightly; to doze; to be in a state of supineness or inactivity; in *OE.*, to lay to sleep; to stun: N. light sleep; sleep not deep or sound; repose. SLUM'BERING, imp.: N. state of repose. SLUM'BERED, pp. *-bĕrd*. SLUM'BERER, n. *-bĕr-ĕr*, one who slumbers. SLUM'BERINGLY, ad. *-lĭ*. SLUM'BEROUS, a. *-us*, or SLUM'BROUS, a. *-brus*, inviting or causing sleep. SLUM'BERY, a. *-bĕr-ĭ*, in *OE.*, slumberous.

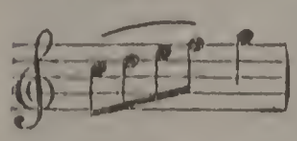
SLUMP, v. *slump* [Low Ger. *slump*, a chance: Dan. *slumpe*, to light, to stumble: Scot. *slump*, a marsh]: to fall suddenly down into any wet or dirty place. SLUMP'ING, imp. SLUMPED, pp. *slumpt*.

SLUMP, n. *slump* [Dan. *slump*, a lot: Sw. *slumpa*, to buy things in block]: the gross total: V. to throw things together into a single lot or mass. IN THE SLUMP, in the gross amount. A SLUMP SUM, a sum named without giving detailed particulars and values.

SLUNG, v. *slung:* see under SLING.

SLUNK, v. *slungk:* see under SLINK.

SLUR, v. *slĕr* [O. Dut. *slooren*, to trail along the ground, as a loose hanging garment: Swiss, *schlargg*, a spot of dirt: Low Ger. *sluren*, to hang loosely: Bav. *schlier*, mud: Norw. *slöre*, to sully]: to soil; to contaminate; to sully; to disgrace; to pass lightly; to do carelessly or imperfectly, with *over;* to sing in a gliding style; to run notes into each other: N. a mark or stain; slight reproach or disgrace. In *music*, a mark thus, ⌒, drawn over two or more notes *not* on the same degree, to indicate that these notes are to be played *legato*, or smoothly and fluently. In vocal music,



a slur is placed over all the notes that are to be sung to the same syllable, unless where they are grouped together by a common line. A slur must be distinguished from a *tie*, which is a similar arch drawn over two notes on the same degree, and denoting that, instead of the two notes written, one is to be played of the length of both. SLUR'RING, imp. SLURRED, pp. *slĕrd:* ADJ., marked with a slur; performed in a smooth gliding style; done imperfectly. SLURREDLY, ad. *slĕrd'lĭ*.

SLUSH, n *slŭsh*, or SLOSH, n. *slŏsh* [an imitative word. Sw. *slaska*, to dash or dabble; *slask*, dirty liquid: Bav. *schlotz*, mud or dirt]: a familiar term for wet mud or dirty liquid, as snow in a state of liquefaction; a greasy lubricating mixture; on *shipboard*, the grease of pork and beef skimmed from the ship's coppers, generally the cook's perquisite; a mixture of white lead and lime: V. to smear with slush or grease; to shower water over, as a ship's deck. SLUSH'ING, imp. SLUSHED, pp. *slŭsht*. SLUSHY, a. *slŭsh'ĭ*, consisting of soft mud or of melting snow.

SLUT, n. *slŭt* [Low Ger. *slatte*, anything that hangs loose and flagging: Dut. *slodde;* Dan. *slatte*, a negligent, slovenly woman: Norw. *slott*, an idler: comp. Gael. *slaodaire*, a lazy person]: an untidy, dirty woman; a term of slight contempt applied to a woman—the correlative of *sloven*. SLUT'TERY, n. *-tĕr-ĭ*, the practice of an uncleanly and untidy woman; dirtiness. SLUT'TISH, a. *-tĭsh*, careless of dress and neatness; dirty. SLUT'TISHLY, ad. *-lĭ*. SLUT'TISHNESS, n. *-nĕs*, untidiness; dirtiness.

SLUTSK, *slôtsk:* town of European Russia, govt. of Minsk, about 63 m. s. of the town of Minsk, near the source of the Lesser Slutch. Except its public buildings, the houses are of wood. It is a market for grain, flax, linseed, and timber. Pop. (1883) 19,006.

SLY, a. *slī* [Icel. *slægr*, crafty: Ger. *schlau;* Dan. *slug;* Low Ger. *slou*, cunning: Gael. *sliog*, sly, sneaking (see SLEIGHT)]: cunning; artful; crafty; subtle; wily; clever in doing things secretly and escaping detection, usually implying meanness; in *OE.*, slight; thin; fine. SLYLY, ad., or SLILY, ad. *slī'lĭ*, with secret artifice; insidiously. SLY'NESS, n., or SLI'NESS, n. *-nĕs*, the state or quality of being sly; artfulness. ON THE SLY, in a secret manner. SLY-BOOTS, a sly or waggish person.

SMACK, n. *smăk* [Dut. *smak*, noise made in eating; *smaken*, to taste: Ger. *schmatz*, a hearty kiss; *geschmack*, taste; *schmecken*, to taste: Dan. *smæk*, a smack: Pol. *smak*, taste, relish: AS. *smæccan;* Sw. *smaka*, to taste: Low Ger. *smakken*, to smack the lips]: a noise made with the tongue and lips in eating or drinking with relish; the noise made with the lips in kissing, or with the thong of a whip; a loud kiss; a blow or slap given with the flat of the hand; savor; a small quantity; taste; tincture or quality: V. to make a noise with the lips after eating or drinking, or in kissing; to be tinctured with any particular quality or flavor; to slap with the hand, as the face; to crack, as a whip. SMACK'ING, imp.: N. a sharp quick noise, with the lips, etc.: ADJ. making a sharp brisk sound. SMACKED, pp. *smăkt*.

SMACK, n. *smăk* [Low Ger. *smakk;* Dut. *smak;* Dan. *smakke,* a light vessel: AS. *snakk;* Icel. *snekkja,* a small vessel]: generic term for small decked or half-decked vessels employed in the coasting and fishing trade. The majority of smacks are, however, rigged as cutters, sloops, or yawls. According to Wedgewood, the *m* in this word is a corruption of *n;* the Anglo-Saxon has *snakk,* a small vessel, and there is a corresponding form in the other Teutonic and Scandinavian tongues.

SMACKERING, n. *smăk'ėr-ĭng* [from SMACK 1]: a smacking of the jaws at thought of food; a longing for.

SMAL'CALD: see SCHMALKALD.

SMALL, a. *smawl* [Dut. *smal,* thin, narrow: Icel. *smár;* Goth. *smals;* Dan. *smaa;* Fris. *sma,* small: Gael. *smad,* a particle: OHG. *smahe,* small]: not great; slender; of little moment, weight, or importance; little in degree; soft; not loud; trifling: N. the small or narrow part of anything, as of the leg or back. SMALL'ISH, a. *-ĭsh,* somewhat small. SMALL'NESS, n. *-nĕs,* the quality or state of being small; little in size, quantity, or value. SMALL'Y, ad. *-ĭ,* in *OE.,* in little quantity; in low degree. SMALL-ARMS, warlike weapons, as rifles, pistols, etc., as distinguished from great guns or cannon; all weapons actually carried by a man (see the respective titles: FIREARMS: PISTOL: BAYONET: SWORD: LANCE: ETC.). SMALL-ARMS FACTORIES, ROYAL, establishments through which all small-arms of every kind are supplied to the British regular army, the militia, yeomanry, and volunteers. The headquarters are at Enfield (q.v.), where there is a vast manufactory; and at Birmingham is a considerable establishment for viewing the arms supplied by contractors. SMALL-BEER, an inferior kind of table-beer. SMALL-CLOTHES, the nether garments of men, as breeches or trousers. SMALL-COAL, coal separated from the larger parts. SMALL-CRAFT, vessels in general of a small size. SMALL-DEBTS' COURT, in *Scot.,* court for the recovery of debts of small amount; in England (see COUNTY COURTS): in the United States any court takes cognizance of any amount of debt, large or small; though on actions for sums under $50, recovery usually carries the costs with it only in a justice's court. SMALL-HAND, the kind of writing used in ordinary correspondence, as distinguished from text or large-hand. SMALL PICA, a kind of type used in printing. SMALLPOX, a loathsome eruptive skin disease, highly contagious (see below). SMALL-STUFF, spun yarn, and the smallest kinds of ropes. SMALL-TALK, prattle; gossip. SMALL-WARES, such textile articles as tapes, braids, bindings, fringes, etc. TO SING SMALL, to speak humbly; to cease tall talk. THE SMALLS, in Oxford Univ., the *Little-go* or previous examination; the final examination for a degree is called the *Great-go* or GREATS.—SYN. of 'small, a.': little; minute; diminutive; feeble; unimportant; trivial; insignificant; paltry; mean; short; weak; fine; slender; gentle; petty; soft.

SMALLAGE, n. *smawl'āj* [AS. *smœl,* small; F. *ache,* parsley—from L. *apĭum,* parsley]: the celery, which see.

SMALL'POX, or VARIOLA, *va-rī'ō-la:* one of the most formidable of the class of febrile diseases known as *Exanthemata* (q.v.). All cases of regular smallpox are divisible into three stages—(1) the initial or eruptive fever; (2) the progress and maturation of the specific eruption; (3) the decline. The *first stage* begins with rigors, followed by heat and dryness of the skin, quickened pulse, furred tongue, loss of appetite, pain in the pit of the stomach, with nausea, vomiting, headache, and often pains in the back and limbs. The violence of the pains in the back, and the obstinacy of the vomiting, are frequently well-marked and characteristic symptoms. In children, the disease is often ushered in by convulsions; while delirium sometimes attends its onset in adults. On the third day, minute red specks begin to come out first on the face, then on the neck and wrists and on the trunk of the body, and lastly on the lower extremities. The fever usually begins to subside as soon as the eruption appears, and by the beginning of the fifth day, when the eruption is generally completed, the fever has entirely disappeared. The *second stage* commences when the eruption is fully out. On the second or third day of the eruption, a little clear lymph is seen in each pimple, which has increased considerably in size since its first appearance, and which is thus converted into a *vesicle.* The vesicles gradually increase in breadth, and become converted into *pustules,* which are at first depressed in the centre, but by the fifth day of the eruption become turgid and hemispherical; the suppuration on the face being complete by about the eighth day from the beginning of the fever, and the same process rapidly following in the other parts of the body in the same order of succession in which the eruption originally appeared. The pustules then break, and scabs or crusts form over them, which usually fall off after four or five days. The number of pustules in any special case, and the severity of the disease, stand in a direct ratio to one another; for in the first place, the number of pustules indicates the quantity of the variolus poison reproduced in the blood; and, in the second place, it is also a direct measure of the extent to which the skin suffers inflammation. The progress of the pustules is usually accompanied with swelling of the skin of the face, with a painful sensation of heat and tension; the scalp is often swollen; soreness of the mouth and salivation usually supervene; and the patient exhales a peculiar and disagreeable odor. About the eighth or ninth day of the disease, a recurrence of the fever, known as 'the fever of maturation,' sets in with varying intensity, according to the number and arrangement of the pustules. When the pustules are numerous, they run together; when they are few, they keep separate. Hence the division of smallpox into the two great varieties *distinct* and *confluent,* or *variola discreta* and *variola confluens;* and this division is of the highest importance, because the distinct form of the disease, in

which the pustules are isolated, is scarcely ever dangerous; while the confluent form, in which they coalesce, is never free from danger. The *third* or *declining stage* is, in the distinct variety, little else than a period of convalescence. About the 11th and 12th day, the pustules on the face become brown and dry at the top, or some of them break, and the fluid which oozes out solidifies into a yellowing crust; and from this time the process of *desiccation* goes on, the swelling of the face subsides, and at last only dry scabs remain, which gradually fall off about the 14th day: three or four days later, the same process is completed over the whole body. The scabs are usually completely gone by the 21st day, leaving behind them blotches of reddish-brown color, which sometimes continue for months before they quite disappear; and some of the pustules, in consequence of ulceration of the true skin, leave pits, especially on the face, which remain through life. The period of scabbing is accompanied by various symptoms of improvement: the tongue becomes clean, the appetite returns, and by the time that the scabs have fallen off, the patient may be regarded as restored to health; so that the course of a case of distinct or discrete smallpox occupies about three weeks.

In the confluent form of the disease, the eruptive fever is more violent, the pain in the back is more severe, the vomiting more obstinate, and the eruption comes out earlier and less regularly than in the distinct variety. Moreover, the pustules do not fill so completely, nor are they of the normal yellow purulent hue, being whitish, brown, or even purple. But the most important difference between the two forms is in the *secondary fever*, which sets in when the pustules are mature. This fever, which is slightly marked in distinct smallpox, is usually intense and highly dangerous in the confluent form; and it is at this period of the disease that death usually occurs. Statistics show that the 8th day of the eruption is the most perilous *day*, and the second week the most perilous *week*. The early occurrence of death—i.e., during the first week—denotes peculiar malignancy in the disease. During the second week, the disorder proves fatal chiefly in the way of apnœa, from some affection of the respiratory passages. After that period, the characters of asthenia commonly predominate, the patient sinks under some casual complication, or the powers of life are gradually worn out by so much irritation of the surface, and the amount of suppuration.

The above are the essential symptoms of smallpox, both in the distinct and in the confluent form. This disease is, however, often accompanied by other symptoms, which we have space merely to name; e.g., sore throat (which often depends on pustules situated there), salivation, and (in the confluent form, during the secondary fever) erysipelatous inflammation, leading to formation of abscesses, glandular swellings, sloughing

sores on the sacrum (bed-sores), etc. In pregnant women, the disease often causes abortion, which is usually followed by death. The dead child occasionally, but not often, is covered with pustules.

The *cause* of smallpox is universally conceded to be a specific contagion. This acts either through the air or by contact with the skin, or by inoculation; and the disease may be caused by the dead body, even when it has not been touched. Opinions are divided as to the period at which the disease begins to be and ceases to be contagious. It is safest to maintain that it is capable of self-propagation as soon as the febrile symptoms have exhibited themselves. How soon the patient ceases to be dangerous, cannot be decided with accuracy; but the stability of the contagious principle may be inferred from the fact that clothing will retain it for months and it is said for years, when confined. Like all the contagious exanthemata, smallpox appears in epidemic form, at irregular, and seemingly capricious intervals. After an extraordinary exemption, perhaps for years, a district is suddenly invaded by it, and suffers for a longer or shorter period; the disease then dies out, as it were, and does not reappear perhaps for years. Different epidemics vary very much in their severity, and sporadic cases are usually milder than cases when the disease is epidemic. Race has much to do with the severity of the disease; the constitution of the dark races, the Negro and the Red Indian, being singularly susceptible of the contagion, and exhibiting very little power of resisting the fatal tendency of the disease.

Of the means that have been employed for counteracting this disease, *Inoculation* protected the individual, but increased rather than diminished the total number of deaths; while *Vaccination* has the advantage of protecting both the individual and the community. Although, in the great majority of cases, vaccination affords perfect protection against smallpox, it very frequently happens that vaccinated persons, when exposed to the contagion, get the disease in a modified form, milder and shorter even than after inoculation, and therefore incomparably milder than in the natural form. The disorder occurring under these circumstances, has received the various names of *modified* or *post-vaccinal* smallpox, or *varioloid*. In varioloid the forms are very various, but in all of them the initial fever is much milder, and the vesicles and pustules much fewer than in smallpox; the complications and after effects are rarely serious. The secondary fever seldom appears, and the specific odor of smallpox is always absent. The disease is, nevertheless, true smallpox and an unvaccinated person brought in contact with a sufferer from varioloid may contract smallpox in its most virulent form.

With regard to prognosis, it may be stated generally that smallpox is a very fatal, and was formerly an extremely destructive disease—one death occurring in every

four cases. It is more fatal at the two extremes of life than in the intervening period, and, as has been already noticed, is especially dangerous in pregnancy. In olden times it was believed that the eruption was an effort of nature to get rid of the noxious matter; hence heating and stimulating measures were adopted with the view of promoting the eruption. To Sydenham belongs the credit of first recommending an entirely opposite or cooling mode of treatment.

In mild cases and in cases of varioloid, the physician has merely to guard the patient against hurtful influences, such as stimulating foods or drinks, too hot a room, or improper exposure to cold, and to prescribe cooling drinks during the fever, and occasional laxatives. In more severe cases, the fever may be combatted by saline purgatives, prescribed so as to produce two or three liquid stools daily, and by free ventilation of the surface of the body. When the eruption is all out, if the pimples on the face are few and distinct, the danger may be regarded as over, and no further treatment is required. If, however, the disease assume a confluent form, wakefulness and restlessness are apt to come on about the eighth day, and the physician may resort to opiates. If the pustules are abnormally torpid in reaching their maturity, it may be expedient to administer strong broths, or even wine; and when the pustules are livid, and intermixed with Petechiæ, bark and acids must be additionally ordered, though the patient is then often beyond the reach of help. During the secondary fever, the bowels must be kept gently open, and opiates should be prescribed once or twice each day. A more nourishing diet is now called for, and wine should be given if the pulse is very weak. The external itching is partly relieved by the opiates, but local applications also are employed: cold cream, or a mixture of equal parts of olive oil and lime-water, may be thus used with advantage. Special methods have been devised to prevent the pitting or seaming of the face, often a permanent disfigurement. Some physicians have used with good results cold or tepid compresses of light weight constantly applied over the face and eyes: the water with which the compresses are wetted may be a weak solution of boracic acid. Others recommend touching each distinct papula with silver nitrate; and in confluent smallpox the use of a wash, consisting of a strong solution of that salt. Many other methods have been proposed, but the principle at the base of all which give good results is the protection of the pustules from the action of light, or rather of the chemical rays at the violet end of the spectrum.

During the period of desquamation, an occasional warm bath may be prescribed with advantage; and the patient should always resort to this measure, as a precaution against carrying the contagion about with him, before again mingling in society. The course of vaccina, or the protective process caused by vaccination, is more

rapid than that of smallpox, and this fact may sometimes be used to advantage when a case of smallpox is seen at its inception or when an unprotected person has been exposed to contagion. If vaccination, in such a case, is practised immediately it overtakes the smallpox, so to speak, and either prevents it or makes it assume a varioloid form.

The history of this remarkable disease is not clearly traceable farther back than the 6th century of our era. China and India are regarded as the original home of smallpox. The first mention of it in literature was by the Arabian historian Masudi, who tells of a visitation of smallpox among the Abyssinians besieging Mecca A.D. 570. The Syrian physician Aron (about 622) speaks of smallpox as a well-known disease; and Rhazes, Arabian physician early in 10th century, declares that smallpox was known to Galen. After the Crusades, it prevailed in most of the temperate countries of Europe, but did not reach the northern countries, Norway, Lapland, etc., till later. In 1517 it was carried from Europe to St. Domingo; and three years later, it reached Mexico, where it committed fearful devastations, and whence it spread with intense virulence throughout the new world. (According to Robertson, three millions and a half of people were destroyed in Mexico alone.) In 1707 it was introduced in Iceland, when more than a fourth part of the population fell victims to it; and it reached Greenland in 1733, almost depopulating the country. These facts illustrate a law that seems universally true, that a contagious disease is always most virulent on its introduction to a new scene of action.

SMALL'POX IN SHEEP (*Variola ovina*): disease resembling the smallpox in man; but a distinct disease, not communicable either by contagion or inoculation, to men or children, or even to dogs or goats. Although common on the continent of Europe, it was unknown in Britain till 1847, when it appeared in Norfolk and the eastern counties, and in the summer of 1862 in Wiltshire. Variolous sheep or infected skins appear in both cases to have imported the disease from abroad. About ten days after exposure to contagion, the infected sheep become feverish, have a muco-purulent nasal discharge, and a hot tender skin. The red pimples which first appear, in about three days become white, and afterward leave scabs or ulcers. The weakness is great; mortality varies from 25 to 90 per cent. Good food and nursing are the remedies. If separation of sick from sound does not immediately check the disease, the whole sound flock should be inoculated, producing a mild artificial form of the disease.

SMALLS, ROBERT: slave, naval captain, and congressman; b. Beaufort, S. C., 1839, Apr. 5. While a slave he was a ship-rigger at Charleston ten years; in 1861, while pilot of the steam-transport *Planter*, he ran the steamer

out and delivered it to the Union blockading fleet, and was himself employed by the fleet as pilot. For his heroism in battle he was made captain 1863, and commanded the *Planter* till the end of the war. After this, living in his native town, he was delegate to the S. C. constitutional convention 1868, state representative the same year, and state senator 1870 and 72; and member of congress 1884-88. He has been also major-general of state militia. From 1898, he was collector of customs at Beaufort, S. C. With no education, except such as he acquired without tuition, he has done honor to himself and his race.

SMALLWOOD, *smawl'wûd,* WILLIAM: soldier: 1732-1792, Feb. 14; b. Prince George co., Md. Elected col. of the Md. battalion 1776, Jan. 2, he was with Washington in New York, July 10, with nine companies, and Aug. 20 in the battle of Brooklyn Heights lost nearly half his command. At White Plains, Smallwood's command again bore the brunt of the fight, and the colonel was wounded. Promoted brigadier-general Oct. 23, he took part in the battle of Fort Washington Nov. 16, with severe loss: at Germantown the Md. line, still commanded by Smallwood, retrieved the field for the American arms 1777, Oct. 4. During that winter, while stationed at Wilmington, Smallwood captured a British brig, and at Camden won new laurels by gallantry. Appointed major-general 1780, Sep., he refused after the removal of Gates to serve under the command of Steuben, though the latter was his senior officer. He was chosen representative in congress 1785, and the same year was elected governor of Maryland.

SMALT, n. *smawlt* [It. *smalto,* enamel, plaster of Paris, etc.: Ger. *schmelz,* enamel; *schmelzen,* to smelt]: a glass colored by Cobalt (q.v.), which, when finely ground, acquires a beautiful azure color—used in water-color painting as a pigment, and in printing upon earthenware: also the colored glass compositions used for making the tesseræ in mosaics. SMALTO, n. *smawl'tō* [It.]: the minute regular squares of colored glass used in the modern Roman mosaic. SMAL'TINE, n. *-tĭn,* arsenide of cobalt, one of the most important ores of cobalt.

SMALTITE: 'gray cobalt,' 'tin-white cobalt,' the chief ore of cobalt, is a tin-white to steel-gray, metallic mineral. Essentially it is cobalt diarsenide, $CoAs_2$, but nickel is usually present and as its percentage increases the mineral graduates into chloanthite, the isomorphous nickel diarsenide. It also generally contains iron and a small amount of sulphur. It is usually massive, but crystallizes in the isometric system, the crystals showing distinct octahedral cleavage. As the orthorhombic mineral, safflorite, has the same composition, smaltite is one of the few illustrations of an isodimorphous mineral. Its hardness is 5.5 to 6; specific gravity 6.2 to 6.5; the massive mineral is thus distinguished from the

softer and much heavier safflorite. Its color is tin-white to steel-gray; streak grayish-black; lustre metallic; opaque. It is easily fused to a magnetic globule which affords reactions with borax beads, for iron, cobalt and nickel. Its most noteworthy occurrences are in the silver and copper mines of Saxony, Bohemia, and England.

SMART, a. *smârt* [Ger. *schmerz;* Sw. *smärta;* Dut. *smart,* pain, ache: Dan. *smerte,* pain]: pungent; severe; painful; keen; sharp; quick; brisk, as a breeze; acute-witty; lively; trim; dressed in a showy manner; clever; intelligent: N. pungent lively pain; a pricking pain, as from nettles; severe or pungent grief: V. to feel a lively pungent pain; to experience a pricking pain, as from nettles; to experience pain of mind, as to *smart* under an injury; to bear the evil consequences of anything; to be punished. SMART'ING, imp. SMART'ED, pp. SMART'LY, ad. *-lĭ.* SMART'NESS, n. *-nĕs,* the quality of being smart or pungent; liveliness; poignancy; severity. SMART-MONEY, money paid to relieve from some unpleasant engagement, particularly from military service (see RECRUITING): in *mil.,* money allowed to soldiers and sailors for wounds and injuries received; in *law,* excessive damages. SMARTEN, v. *smârt'n,* to make smart; to trim and dress in a showy manner. SMARTENING, imp. *smârt'nĭng.* SMARTENED, pp. *smârt'nd.*—SYN. of 'smart, a.': active; lively; brisk; pungent; sharp; quick; vigorous; acute; witty; vivacious; keen; tart; dashy; showy; clever.

SMART, HELEN HAMILTON GARDENER: American novelist: b. Winchester, Va., 1858, Jan. 21. She has published: *Men, Women, and Gods* (1885); *A Thoughtless Yes* (1890); *Is This Your Son, My Lord?* (1895); *An Unofficial Patriot* (1898); *Historical Sketches of Our Navy;* etc.

SMART, HENRY: English organist and composer; b. London 1813, Oct. 26; d. there 1879, July 6. He was educated for the law, but turned his attention to music, became organist of the parish church at Blackburn in 1831, and while there composed his first important work, an anthem. He removed to London in 1836 where he engaged as an organist, teacher, and composer. Among his compositions are: An opera, *Bertha* (1855); the cantatas, *The Bride of Dunkerron* (1864); *King René's Daughter* (1871); *The Fisher Maidens; Jacob,* an oratorio.

SMART'WEED. See POLYGONEÆ.

SMASH, v. *smăsh* [Sw. *smask,* a crack, report: Gael. *smuais,* to break in pieces: Dan. *smaske,* to smack with the lips in eating]: to dash to pieces; to break in pieces by violence; to crush; in *slang,* to pass base coin: N. a breaking in pieces; utter destruction. SMASH'ING, imp. SMASHED, pp. *smăsht.* SMASH'ER, n. *-ĕr,* one who or that which smashes; *familiarly,* anything decisive; a thing very large or extraordinary; in *slang,* one who makes or passes false coin.

SMATCH, v. *smăch* [Low Ger. *smaksen;* Ger. *schmatzen*, to smack in eating (see SMACK 1)]: in *OE.*, to smack; to have a taste: N. a taste; a tincture; a twang. SMATCH'ING, imp. SMATCHED, pp. *smăcht.*

SMATTER, v. *smăt'tėr* [Ger. *schmatzen;* Swiss, *schmatzern;* Norw. *smatta*, to smack with the tongue in eating: Fris. *smeijtsen*, to taste, to try: comp. Dan. *snadre*, to jabber]: to have a slight taste; to have a superficial and imperfect knowledge; to talk superficially. SMAT'TERING, imp.: N. a slight or superficial knowledge. SMAT'TERER, n. *-ėr*, one having only a slight or superficial knowledge.

SMEAR, v. *smēr* [Dut. *smeren;* Ger. *schmissen*, to smear, to daub: AS. *smeru;* Icel. *smör*, grease, butter]: to overspread with greasy, fatty, or adhesive matter; to daub; to soil. SMEAR'ING, imp. SMEARED, pp. *smērd.* SMEAR'ER, n. *-ėr*, one who smears.

SMEATH, n. *smēth:* a sea-fowl, also called the SMEW.

SMEATON, *smē'ton*, JOHN: English civil engineer: 1724, June 8—1792, Oct. 28; b. Austhorpe, near Leeds. At the age of 15 he had constructed a machine for rose-engine turning. About 1750 he removed to London to begin business as a mathematical instrument-maker; but we find him in the following year resuming his desultory experiments in mechanical invention, an 'odometer' for ships, a compass, and improvements in water and windmill-machinery being the chief products. His improvements on mill-work were found on trial to be of great value, increasing the effective force by one-third, and gained S. the Copley medal of the Royal Society 1759. In 1754 he visited the Netherlands, and inspected the embankments and canals. 1756, Aug., operations were begun on Eddystone rock for building a stone light-house after his designs (see EDDYSTONE): the building was executed 1757, June—1759, Oct., and the lantern lighted Oct. 16. This work, then the greatest of its kind ever undertaken, gave S. a place at the summit of his profession, and remained for 120 years a monument of his engineering skill. Yet he seems to have had little employment till 1777. Among his chief works were: construction of the greater portion of Ramsgate harbor (1774); laying out of the line, and superintendence of construction of the Forth and Clyde canal; excavation of most of it; rendering of the Calder (Yorkshire) navigable; erection of Spurn light-house, and of several important bridges in Scotland, and an immense amount of mill-machinery. In 1783, in declining health, he retired from active business, dying at Austhorpe of paralysis. His numerous professional Reports, pub. 1797 in three 4to vols., were regarded by his successors 'as a mine of wealth.' See Smiles, *Lives of the Engineers.*

SMECTITE, n. *smĕk'tīt* [Gr. *smēktris*, marl, fuller's earth—from *smēchō*, I wipe off]: a kind of fuller's earth, having a greasy feel.

SMEE, *smē*, ALFRED: surgeon: 1818–1877, Jan. 11; b. England. He became a member of the Coll. of Surgeons 1840; was chosen fellow of the Royal Soc., London, 1841; and was appointed surgeon of the Bank of England. He devised the present system of printing Bank of England notes. He made a thorough study of electricity, and invented the galvanic battery which bears his name. He wrote: *Electro-Metallurgy; Sources of Physical Science; Electro-Biology; The Potato Plant; Principles of the Human Mind.*

SMEGMA, n. *smĕg'mă* [L. *smegma;* Gr. *smēgma*, a detergent, soap—from *smēchō*, I wipe off]: the white substance often seen upon the skin of new-born infants. SMEGMATIC, a. *smĕg-măt'ĭk*, cleansing; of the nature of soap.

SMELL, n. *smĕl* [Low Ger. *smelen*, to burn slow with a strong-smelling smoke: Dut. *smeulen*, to burn or smoke in a hidden manner: Sw. *smolk;* Dan. *smul*, dust: the sense of the word seems originally to have been dust, smoke, then smell]: the faculty of perceiving by the organs of the nose certain qualities of bodies; one of the five senses; scent; odor (see NOSE): V. to perceive by the nerves of the nose; to have a particular odor or scent; to exercise sagacity. SMELL'ING, imp.: N. the sense by which odors are perceived. SMELLED, pp. *smĕld*, or SMELT, pp. *smĕlt*. SMELL'ER, n. *-ér*, one who smells. SMELLING-BOTTLE, a bottle containing something to stimulate or refresh through the sense of smell. SMELLING-SALTS, a carbonate of ammonia. TO SMELL A RAT, *familiarly*, to suspect strongly. TO SMELL OUT, *familiarly*, to find out by superior sagacity. —SYN. of 'smell, n.': odor; fragrance; scent; perfume.

SMELLIE, *smĕl'lĭ*, WILLIAM: publisher and author: 1740–1795, June 24; b. Edinburgh. He learned the printers' art, and by private study acquired an education. He became editor of the *Scots Magazine* 1759, and the following year embarked in business as publisher. He was the projector, editor, in part author, and publisher of the original *Encyclopædia Britannica* (1765–71, 3 vols. 4to). He translated and published Buffon's *Natural History*. Among his numerous original works is *The Philosophy of Natural History* (2 vols.), many reissues of which have been made in the United States.

SMELT: pp. of SMELL, which see.

SMELT, v. *smĕlt* [Ger. *schmelzen;* O. Dut. *smelten*, to melt, to dissolve: Dan. *smelte*, to smelt]: to melt or fuse an ore for the purpose of separating the metal; to fuse a metal. SMELT'ING, imp.: N. the act or operation of fusing ores or metals. SMELT'ED, pp. SMELT'ER, n. *-ér*, one who smelts. SMELT'ERY, n. *-ĭ*, smelting-works.—See IRON: ELECTRIC SMELTING.

SMELT, n. *smĕlt* [AS. and Dan. *smelt*, a smelt: AS. *smæl*, small], (*Osmerus*): genus of the Salmon or Trout family (*Salmonidæ*), of which only a few species are known; differing from the salmon, trout, etc., in having long conical teeth on the jaws and tongue, and on the tip of the vomer, the rest of the vomer being destitute of teeth; two distinct rows of teeth on each palatine bone. The COMMON S. (*O. eperlanus*), called *Spirling* or *Sparling* in Scotland, and *Eperlan* in France, is a species scarcely distinct from *Osmerus viridescens*, the Amer. S., found on the n.e. coasts as far s. as the Hudson; the Amer. species has longer body, greener back, and smaller scales. The S. is 8 or 10 inches (rarely 12 inches) in length; the form is very trout-like—rather more slender—the tail larger in proportion, and more forked; lower jaw much longer than the upper. The scales are small; the back is whitish, tinged with green; the upper part of the sides shows bluish tints, the lower part of the sides and the belly are of bright silvery color. The S. has a peculiar, cucumber-like smell, and a delicious flavor, for which it is esteemed for the table, where it appears often as accompaniment of other fish. The S. is an inhabitant partly of fresh water, partly of the sea: it ascends rivers to no great distance from the sea in autumn, and descends in spring. Great numbers of smelts are taken in estuaries, and near the mouths of rivers, by small-meshed nets; also on the open sea-coast, chiefly on low, sandy shores. S. have been kept with success continually in fresh-water ponds, in which they not only throve well without loss of flavor, but propagated abundantly. On the s. coast of England, the name S. or SAND S. is given to the Atherine (q.v.).—Another British species, the Hebridean S. (*O. Hebridicus*), was first discovered near Rothesay in 1837, and described by Yarrel. It is so rare as to be unimportant.

SMELTING: see IRON.

SMERDIS, *smĕr'dĭs* (Persian, BARDIYA): son of Cyrus the Great, who died B.C. 529. He was murdered at the instigation of his brother Cambyses, after their father's death. Before the return of Cambyses from Egypt, a magian, Gaumata (Ionic, Gometes), announced himself as Smerdis, still living, seized the government, and was welcomed by the people. Cambyses in despair killed himself on the way, in Syria. Gaumata—the false S.—reigned, popular as a friend of the people, remitting severe taxes. He was slain by seven conspirators from princely families, B.C. 521—the leader, Darius, succeeding him.

SMEW, n. *smū*, or SMEE, n. *smē*, or SMEATH, n. *smēth* [unascertained], (*Mergellus albellus*): bird of the family *Anatidæ*, very nearly allied to the goosander and mergansers, but having a shorter bill. The whole length of the male is not quite 18 inches; of the female, not quite 15. The S. abounds on the n. coasts of Asia, and in parts of continental Europe

SMIBERT, or SMYBERT, *smī'bĕrt*, JOHN: painter: abt 1684–1752; b. Edinburgh. He studied painting in Italy. He accompanied the renowned Dean (afterward Bp.) Berkeley to America 1729, and settled in Boston. Among his most prized works are portraits of Bp. Berkeley and his family; Jonathan Edwards; Edmund Quincy, and other notable personages. The early American painters, Copley, Trumbull, and Allston, are reputed to have been largely influenced by the works of Smibert.

SMICKER, v. *smĭk'ĕr* [Sw. *smeka*, to caress; *smickra*, to flatter: Icel. *smeykligr*, smooth, sweet]: in *OE.*, to look amorously upon: ADJ. amorous; wanton; gay. SMICK'ERING, imp.: ADJ. looking amorously upon: N. an affected smile or amorous look.

SMIDDY, n. *smĭd'dĭ:* a familiar corruption of *smithy*, the workshop of a blacksmith.

SMIFT, n *smĭft* [etym. doubt.]: in *mining*, a match of paper saturated with nitre or other combustible substance, for igniting a charge of powder; a fuse. Paper rubbed over with gunpowder and grease is also used by miners.

SMIGHT, v. *smīt:* OE for SMITE.

SMILACEÆ, *smī-lā'sē-ē:* natural order of exogenous plants, ranked by Lindley in his class Dictyogens (q.v.), and consisting of herbaceous or half-shrubby plants, generally more or less climbing, with reticulated leaves, and bisexual or polygamous flowers, a 6-parted perianth, six stamens, a free 3-celled ovary, with cells one or many seeded, three stigmas, and a roundish berry. There are about 120 known species, mostly of the genus *Smilax* (q.v.) scattered over the globe, but most numerous in temperate and tropical Asia and America. The root-stocks (*rhizomes*) of many species yield Sarsaparilla (q.v.). But some species have fleshy tubers, particularly *Smilax China*, native of China and Japan, whose tubers are very large and nutritious food. *Smilax pseudo-China*, an Amer. species, has similar tubers.—The roots of *Rexburghia viridiflora*, after being boiled and soaked in lime-water, to remove their acridity, are preserved in syrup for food in the Eastern Peninsula and Malayan Island: the stems are sometimes 100 fathoms long.

SMILACINE, n. *smī'lă-sĭn* [Gr. *smilax* or *smilăka*, the herb bind-weed or rope-weed]: a white crystalline substance found in the root of sarsaparilla.

SMILAX, *smī'laks:* genus of plants of the family or tribe *Smilaceæ*, climbing or supported by a pair of tendrils on the stem of the 3–9-ribbed, mostly ovate leaves, and with small, diœcious flowers; the ovary is 1–6-celled, with as many spreading sessile stigmas, and the fruit a small berry. The common name is Greenbrier or Catbrier. The common Greenbrier, with blue-black berries (*S. rotundifolia*), also *S. Walteri*, N. J. and s., incline to be evergreens, especially southward. *S. glauca*, the leaves abruptly mucronate and glaucous beneath, and *S. tamnoides*, with leaves inclining to violin- or halberd-shape, have rigid prickles. The thin-leaved *S. hispida*, with long

weak blackish prickles, and *S. pseudo-China*, are similar in appearance; but the latter has a tuberous root-stock used to fatten swine and to make beer, at the south. Of the southern narrow-leaved species, *S. lanceolata* has red berries, and *S. laurifolia* thick evergreen leaves, and solitary stigmas. The Carrion-flower, *S. herbacea*, leaves 7-9 nerved, as well as *S. tamnifolia*, the latter with leaves 5-nerved and heart-halberd shaped, are herbaceous and without prickles. There are nearly 200 species known, some tropical species and one European, yielding commercial Sarsaparilla (q.v.)—our Wild Sarsaparilla being of another family.—The so-called smilax of greenhouses, from the Cape of Good Hope, is of another genus (*Myrsiphyllum*) of the same family, if *Smilaceæ* is made a tribe of the Lily family, as of late it is by some authorities. Its leaves, set edgewise to the stem, are transformed branchlets, as shown by its near relative, the European *Ruscus*.

SMILE, v. *smīl* [Sw. *smila;* Dan. *smile;* OHG. *smiclan*, to smile: Dut. *smuylen*, to smile: Skr. *smi*, to laugh]: to express pleasure, moderate joy, love, or kindness, by an expansion of the features of the face; opposite of *frown;* to look gay and joyous; to favor, with *on;* to express slight contempt by a movement of the features of the face; to sneer: N. a natural expansion of the features of the face, expressive of pleasure, moderate joy, etc.; favor; propitiousness; a look resembling a smile, but expressing scorn or contempt. SMI'LING, imp.: ADJ. looking joyous or gay; expressing pleasure or kindness. SMILED, pp. SMI'LINGLY, ad. with a look of pleasure. SMI'LER, n. one who smiles.

SMILES, *smīlz*, SAMUEL, LL.D.: author: b. Haddington, Scotland, 1812, Dec. 23; d. London, 1904, Apr. 17. He was in the practice of surgery at Leeds; became editor of a newspaper 1845; secretary of the Leeds and Thirsk railway, and subsequently of the Southeastern railway, resigning and devoting himself to literary pursuits 1866. Among his published books are: *Physical Education, or the Nature of Children* (1837); *History of Ireland and the Irish People under the Government of England* (1844); *Life of George Stephenson* (1857); *Self-Help, or Illustrations of Character and Conduct* (1859—of which the 55th 1,000 copies had been issued 1864); *Brief Biographies* (1860); *Workmen's Earnings and Strikes* (1861); *Lives of Engineers*, 4 vols. (1861-5); *Industrial Biographies* (1863); *The Huguenots, their Settlements, Churches, and Industries in England and Ireland* (1867); *Character* (1871); *The Huguenots in France after the Revocation, etc.* (1874); *Thrift* (1875); *Jasmin* (1892).

SMILLIE, *smī'lĭ*, JAMES: engraver: 1807, Nov. 23—1885, Dec. 4; b. Edinburgh, Scotland. After apprenticeship in his art, his family removed to Quebec, where he attracted the attention of Lord Dalhousie, under whose

patronage he practiced in London and Edinburgh, but settled in New York 1830. He soon became eminent as engraver of paintings, especially those of Weir, Cole, Durand, Cropsey, Kensett, Bierstadt, etc.—his large copies of Cole's *Voyage of Life* being prominent examples of his work. He was elected member of the National Acad. of Design 1851. After 1861, he applied himself more to bank-note engraving, of which he was early the chief expert. He died in Poughkeepsie.—His son, JAMES DAVID SMILLIE, b. New York 1833, Jan. 16, was a superior engraver; but since 1864, has applied himself to painting in oil and water-colors, becoming an academician 1876; well known also as an etcher. He has been successful especially in atmospheric effects, and in some cattle landscapes—his subjects ranging from France to California.—A younger son of James Smillie, GEORGE HENRY SMILLIE, b. New York 1840, Dec. 29, is noted as an artist alike in oil and water-colors; and became a member of the National Acad. 1882. His landscapes include many coast scenes of New England.

SMIRCH, v. *smėrch*, or SMURCH [Icel. *myrkr*, darkness; *hyrka*, to darken: Russ, *mrachnie*, dark: connected with *smear* and *murky*]: to blacken; to dirty; to soil. SMIRCH'ING, imp. SMIRCHED, pp. *smėrcht*.

SMIRK, v. *smėrk* [O. Ger. *smieren;* Manx, *smooir*, to smile: AS. *smercian*, to smirk]: to smile affectedly or pertly; to look affectedly soft or kind: N. an affected suppressed smile. SMIRK'ING, imp.: ADJ. smiling affectedly or pertly. SMIRKED, pp. *smėrkt*.

SMIRKE, *smėrk*, Sir ROBERT: architect: 1780-1867, Apr. 18; b. Cheltenham, England. His design for the Covent Garden Theatre, London (1809), brought him into public notice, and thereafter he designed numerous public buildings. The most noted of his works in classic style are the Post-office, College of Physicians, King's College, British Museum. His two principal works in Gothic are the restorations of York Minster and the addition and improvements of the Inner Temple, London. He wrote *Specimens of Continental Architecture*.

SMIRKE, SYDNEY: architect: b. England in the beginning of the 19th century; d. 1877, Dec. 8; bro. of Sir ROBERT SMIRKE. He won the gold medal of the Royal Acad. 1819, and thereafter attained distinguished position in his profession. He had a pronounced bias for the Italian style. His chief works are a reformatory in the Isle of Wight, restoration of portions of Litchfield Cathedral and York Minster after the second fire, and of the Temple Chh., London. He was elected prof. in the Royal Acad. 1861.

SMIT, v. for SMITTEN. See under SMITE.

SMITE, v. *smīt* [Low Ger. *smiten;* Ger. *schmeissen;* Dut. *smijten*, to strike: Sw. *smida*, to forge: Dan. *smide*,

to fling: AS. *smitan*, to smite]: to strike, as with the hand or a weapon; to kill or destroy; to punish; to afflict; to chasten; to affect with any passion; to clash together. SMI'TING, imp. SMOTE, pt. *smōt*, did smite. SMITTEN, pp. *smĭ'tn*, or SMIT, pp. *smĭt*, affected with; strongly imbued with. SMITER, n. *smī-tėr*, one who smites. To SMITE WITH THE TONGUE, in *Scrip.*, to reproach; to upbraid; to revile.—SYN. of 'smite': to strike; pierce; kill; destroy; afflict; chasten; blast; collide.

SMITH, n. *smĭth* [from SMITE, which see: Icel. *smidr*, an artificer; *smid*, art, workmanship; *smida*, to construct]: one who *smites* metal into shape; a worker of metal with the hammer; a worker in metals. SMITH'ERY, n. *-ėr-ĭ*, the workshop of a smith; the work done by a smith. SMITH'Y, n. *-ĭ*, the workshop of a smith. SMITH'ING, n. the act or art of working iron into its intended shape. BLACKSMITH, a worker in iron. WHITESMITH, a worker in tinned or galvanized iron; a tinsmith. GOLDSMITH, worker in articles of gold. SILVERSMITH, worker in articles of silver.

SMITH, ADAM, LL.D.: author of a book which has become a landmark in political economy: 1723, June 5—1790, July 17; b. Kirkcaldy, Fifeshire, Scotland. His family belonged to the respectable middle class; his father was comptroller of the customs at the port of Kircaldy, and his mother, Margaret Douglas, daughter of a small Fifeshire laird. His father died a short time before his birth, and he was the object of his widowed mother's affectionate and solicitous care. When he was three years old, the poor woman got a sad fright from a calamity hardly known at the present day—the child was stolen by gypsies; but he was tracked and recovered by his uncle. This was the only adventure in his quiet life. After the usual burgh-school education in Kirkcaldy, he was sent 1737 to the Univ. of Glasgow. He there secured an exhibition on the Snell foundation, which took him to Balliol College, Oxford: there he studied for seven years, gaining large acquirements and showing independence of thought. It is said that he was intended for the Anglican priesthood; if so, his own convictions crossed his friends' designs. He returned to Kirkcaldy, and lived for a while with his mother in seclusion and study. It was said to be his practice to stand ruminating, with his back to the fire, and his head leaning against the chimney-piece—and over an old fireplace in Kirkcaldy it used to be shown how he had thus worn a piece off the paint. In 1748 he came to Edinburgh, where unostentatiously he became one of the brilliant little circle of men of letters then rising to importance. In 1751 he got the chair of logic in the Univ. of Glasgow, which was changed a year afterward for that of moral philosophy. In 1759 appeared his *Theory of Moral Sentiments*, notable for its reference of the mental emotions to the one source of sympathy; a one-sided view which,

though eloquently presented, has gained no place in philosophy. *The Dissertation on the Origin of Languages* was published with the later editions of this book. Both had great reputation in their day, and procured attention to his doctrines on political economy. In 1762, the Univ. of Glasgow gave him the degree Doctor of Laws. The next year he became 'governor' or traveling tutor to the young Duke of Buccleuch. He was already sedulously collecting materials for his great work. He was nearly a year in Paris, and in the circle of renowned wits and philosophers of the reign of Louis XV. In 1766 he returned to Kirkcaldy to live in the old house with his mother. This was the year of the appearance of the *Inquiry into the Nature and Causes of the Wealth of Nations.* If there was any living man to whose works he was indebted for the leading principles of this book, it was David Hume; and from him it had its first emphatic welcome: Hume wrote immediately on receiving it: 'EUGE BELLE.—DEAR MR. SMITH—I am much pleased with your performance; and the perusal of it has taken me from a state of great anxiety. It was a work of so much expectation by yourself, by your friends, and by the public, that I trembled for its appearance, but am now much relieved. Not but that the reading of it necessarily requires so much attention, and the public is disposed to give so little, that I shall still doubt, for some time, of its being at first very popular. But it has depth, and solidity, and acuteness, and is so much illustrated by curious facts, that it must at last take the public attention.' This was not destined to be exactly the literary history of this great work. Its startling doctrines, fine clear style, and abundant illustration from curious facts made an immediate impression; but counteracting influences arose when people saw how far the new doctrines went in playing havoc with old prejudices. The French Revolution set the British mind against everything that breathed of innovation. It was known that the younger Pitt participated at first in Smith's free-trade notions, but he had afterward, whether from permanent connection or temporary policy, to put himself in the foremost ranks of the enemies of innovation. It was not until long after the terrors of that epoch and the nervous vicissitudes of the war had passed over, that Smith's work had an opportunity to revolutionize the public mind on matters of trade and finance. It came up as leader of a great literary host, for expounders crowded in numbers round *The Wealth of Nations* as the text-book of sound economy. It is needless to enlarge on a book so well known and so much read. The only reproach brought against it is, that it is not systematic in its form, and that its nomenclature is not exact. But its author was not arranging the results of established knowledge—he was rather pulling down existing structures of ignorance and prejudice. Nor, indeed, have those who have since attempted to make an exact science

out of political economy, practically vindicated the reproach that they have cast on him of being unmethodical. Whatever we may yet come to, very few portions indeed of political economy admit of being treated as exact science. It is too closely connected with human passions and energies, consequently with special results and changes, to be so treated; and the best books on the subject are still characterized by the discursiveness and mixed philosophy and fact of the *Wealth of Nations.* In 1778, Smith was made a commissioner of customs. The effect of this was to bring him to Edinburgh, and increase his means for indulging in his favorite weakness, the collection of a fine library; for he was, as he called himself, a 'beau in his books.' He lost his worthy mother 1784. In 1787 he was chosen lord rector of Glasgow Univ.—Smith was of a generous nature; open to new ideas, indeed tending to innovation; therefore naturally arguing in the interest of the British working-classes, and sharply criticizing manufacturers and capitalists, and decrying 'politicians.' See his life by J. A. Farrer (Lond. 1880).

SMITH, ALEXANDER: British poet: 1830, Dec. 31—1867, Jan. 5; b. Kilmarnock, Ayrshire, Scotland. He received a fair English education, and passed from school into a Glasgow warehouse as a pattern designer. While following this occupation he began to write poetry. His first volume, the *Life Drama* (1853) created something like a furor in literary circles. A reaction, however, followed, and the author had scarcely found himself famous when he began to be censured. The faults of his book were obvious enough: every page showed immaturity, and its natural result, extravagance; while a rather narrow reading having made him passionately attached to a few modern poets, as Keats and Tennyson, their peculiar turns of expression reappeared in his verse, and gave color to the charge of plagiarism, which was pushed to an absurd length. But impartial critics were not slow to perceive a richness and originality of imagery that atoned for defects of taste and knowledge. In 1854 Smith was appointed secretary to the University of Edinburgh; and 1855, with Sydney Dobell, produced a vol. of *Sonnets on the War.* He afterward wrote *City Poems* (1857), *Edwin of Deira* (1861), and several prose works, e.g., *Dreamthorp* (1863). *A Summer in Skye* (1865), and *Alfred Hagart's Household* (1865).

SMITH, ANDREW JACKSON: soldier: b. Bucks co., Pa., 1815, Apr. 28; d. 1897, Jan. 5. Graduated at West Point 1838, he served on the frontier, attaining the rank of major 1861, and was colonel of cavalry the same year. He was chief of cavalry in Missouri 1861-2; brigadier-general of volunteers 1862, participating in the battle of Corinth, the Yazoo expedition, the taking of Arkansas Post, the Vicksburg siege and capture of Fort De Russy (commanding a division on both occasions),

and the Red river expedition. He was promoted lieutenant-colonel in the regular army 1864, and major-general of volunteers; had part in clearing Missouri of insurgents, and in pursuing Hood in Tennessee. In 1865 he was promoted brigadier-general and major-general in the U. S. army; commanded a corps in taking Mobile; and was chief of the department of Missouri 1867-8, resigning 1869. He was afterward postmaster at St. Louis.

SMITH, Asa Dodge, D.D., LL.D.: Presbyterian pastor, and president of Dartmouth Coll.: 1804, Sep. 21—1877, Aug. 16; b. Amherst, N. H. He graduated at Dartmouth 1830, and at Andover Theol. Seminary 1834; was principal of Limerick Acad., Me., 1830-1; and pastor of the 14th St. Presb. Church, New York, 1834-63, where his scholarship and fine extemporaneous power, first exhibited in college, made him widely known; and he was prominent in benevolent, religious, and other public enterprises. In 1863 he succeeded Dr. Lord as president of Dartmouth, where he died in office.—Among his many publications, mostly addresses, are: *Letters to a Young Student* (1832); *Memoir of Mrs. L. A. Leavitt* (1843); *Importance of a Scriptural Ministry* (1848); *Discourse on the Life of Rev. James Hall* (1854); *The Puritan Churches* (1858); *Home Missions and Slavery* (1857); and sermons on *Christian Stewardship, Beneficence our Life Work, Obedience to Human Law, Death Abolished,* and *Abuses of the Imagination.*

SMITH, Benjamin Bosworth, S.T.D., LL.D.: 1794, June 13—1884, May 21; b. Bristol, R. I.: Prot. Episc. bp. He graduated at Brown Univ.; and though of Congl. parentage, entered the Prot. Episc. ministry; officiated as priest at Marblehead, Mass., 1818-20; afterward as rector of St. George's, Accomack co., Va.; Zion Church, Charleston, Va.; St. Stephen's, Middlebury, Vt.; Grace Mission Church, Philadelphia; and Christ Church, Lexington, Ky., where he was elected bp., and became presiding bishop. While in Middlebury, he edited the *Episc. Register;* and in Philadelphia, the *Episc. Recorder.* He published *Five Charges to the Clergy; Saturday Evening, or Thoughts on the Progress of the Plan of Salvation* (1876); and *Apostolic Succession* (1877).

SMITH, Charles Ferguson: soldier: 1805-62; b. Pa. He was a graduate of West Point Milit. Acad.; served in the war with Mexico; in the civil war attained the rank of major-general. For a time he was in command of the national forces in Ky. He took part in the investment of Fort Donelson and in the repulse of the Confederate sally.

SMITH, Charles Henry (Bill Arp): American humorist: b. Lawrenceville, Ga., 1826, June 15; d. 1903, Aug. 24. He was graduated at Franklin College, Ga., 1848, practiced law, first at Rome, Ga., and then at Cartersville, and served in the Confederate army through-

out the civil war, becoming major on the staff of the 3d Georgia brigade. He was a state senator 1866-8, and was well known as the author of the 'Bill Arp' letters, contributed to the Atlanta *Constitution* and to *Home and Farm*, of Louisville, Ky. He published: *Bill Arp's Letters* (1886); *Bill Arp's Scrap Book; A Side Show of the Southern Side of the War; Fireside Sketches* (1890); *Georgia as Colony and State, 1733-1893* (1890); *The Uncivil War from 1861 to Date.*

SMITH, Cotton Mather: 1731, Oct. 26—1806, Nov. 27; b. Suffield, Conn.: Congl. minister. His mother was granddaughter of Increase Mather, and his father a descendant of Henry Smith, first pastor at Wethersfield, who came to America 1636. Graduated at Yale 1751, Smith studied theology with Jonathan Edwards, assisting him as a teacher of the Stockbridge Indians 1751-53, after which he was pastor at Sharon, Conn., until his death. In 1775-6 he acted as chaplain to the troops of the n. parts of the colony of N. Y. Of the 4,000 sermons that he is said to have written, he published three (1770-93). His reputation was high as a scholar, a preacher, and a man of independent thought and winning character.—See Sprague's *Annals*, I.

SMITH, Edmund Kirby: Confederate general: 1824, May 24—1893, Mar. 28. He graduated at West Point 1845, he was promoted for gallantry in the Mexican war; was assistant professor of mathematics at West Point 1849-52; cavalry captain in frontier service 1855, becoming major 1861. At the beginning of the civil war he entered the Confederate service as lieutenant-colonel of cavalry; brigadier-general and major-general 1861; lieutenant-general 1862, and general 1864; was wounded at Bull Run; commander in Kentucky, e. Tennessee, n. Georgia, and w. North Carolina 1862, defeating the Union force at Richmond, Ky., and of the trans-Mississippi department 1863, where he showed much ability in organizing government and industries. He defeated Gen. Banks 1864. He was president of the Atlantic and Pacific Telegraph Co. 1866-68; of the University of Nashville 1870-75; and thereafter professor of mathematics in the University of the South.

SMITH, Edward Parmelee: 1827, June 3—1876, June 15; b. South Britain, Conn.: Congl. minister, and executive in benevolence. He graduated at Yale, 1849; taught in Mobile, Ala., 3 years; graduated at Union Theological Seminary, New York, 1855; was pastor of the Congregational church at Pepperell, Mass., 1856-62; superintendent of the Christian Commission at the west, in the civil war, 1863-65; field secretary of the American Missionary Association 1866-7; U. S. agent of Indian affairs in Minnesota 1873; and president of Howard University at Washington 1873-76.—He published *Incidents of the U. S. Christian Commission* (1869).

SMITH, Eli, D.D.: missionary and Arabic scholar:

1801, Sep. 13—1857, Jan. 11; b. Northford, Conn. He graduated at Yale 1821, at Andover Theol. Seminary 1826, and the same year went to Malta to superintend the American Board's printing-office there, and visited Beirut to study Arabic 1827-8. Afterward he was missionary to Syria and made Beirut his headquarters 1833; prepared molds for improved Arabic type (modelled after a fine MS. of the Koran) at the Tauchnitz establishment at Leipzig 1839. He published, with Dr. Dwight, *Missionary Researches in Armenia,* 2 vols. (1833). In 1846 he began his great work of translating the Bible into Arabic, for 60 millions of people; and had completed the New Test., the Pentateuch, and much of the Prophets, when he died. The work was finished by Dr. Cornelius Van Dyke (1866-7).

SMITH, Francis Hopkinson, L.H.D.: artist, author, and civil engineer: b. Baltimore, Md., 1838, Oct. 23. His engineering work has been chiefly in connection with U. S. govt. contracts. His artistic and literary life has been mainly in New York. He paints principally in water-color, among his best pictures being *In the Darkling Wood* and *A January Thaw.* His literary style is light but refined and entertaining. Among his publications are: *Well-Worn Roads* (1886); *A White Umbrella in Mexico* (1889); *Colonel Carter of Cartersville* (1891); *A Book of the Tile Club* (1887); *A Day at Laguerre's* (1892); *Tom Grogan* (1895); *Gondola Days* (1897); *Caleb West* (1899); *The Under Dog* (1903); *The Tides of Barnegat* (1906); *The Veiled Lady* (1907); and others.

SMITH, George: Assyriologist: 1840-76, Aug. 29; b. Chelsea, England. His interest in Assyrian inscriptions was awakened first while examining paper casts of Assyrian monuments in the British Museum; and thenceforward he applied himself to Assyriology. His first notable feat was the deciphering an inscription of Shalmaneser II recording the war against Hazael. He was one of the editors of a vol. on *Cuneiform Inscriptions of W. Asia,* 1867. Among the noteworthy cuneiform inscriptions deciphered by him prior to 1873 were: a tablet recording the solar eclipse of B.C. 763, June 15; memorials of the Israelitish kings Azariah, Pekah, and Hoshea; notices of the conquest of Babylonia by the Elamites, B.C. 2280; a religious calendar; an account of the Noachian deluge (later found to be one of 12 tablets containing the history of an unknown hero). He visited the site of Nineveh 1873, again 1874, and brought back more than 3,000 inscribed tablets, some entire, others in fragments. Again he set out for Nineveh 1876; but being detained in Syria, he discovered the ruins of Carchemish, cap. of the anc. Hittites; study of these ruins led him to infer a Hittite origin of the Etruscans; but this view is not accepted by antiquarians. Smith died at Aleppo. He wrote an account of his *Explorations in*

Assyria; The Chaldean Account of Genesis; Ancient History of Assyria.

SMITH, GERRIT: 1797, Mar. 6—1874, Dec. 28; b. Utica, N. Y.: capitalist, orator, and reformer; son of Peter Smith, who acquired an immense landed estate. He graduated at Hamilton College 1818; and was known first as active in promoting African colonization, but joined the anti-slavery movement 1835. He organized an anti-rum-shop party 1842. In 1848 he began to give away 200,000 acres of land in small parcels to the poor, including many negroes. A representative in congress 1852, he retired after brief service. In 1858 he was candidate for governor as abolitionist and prohibitionist. He gave much aid to freedom in Kansas, and to John Brown; and was temporarily insane after Brown's sad affair at Harper's Ferry, to which, however, he was not privy. During the civil war he gave largely to the Union cause; but, satisfied with the results of the war, joined Cornelius Vanderbilt and Horace Greeley in liberating Jefferson Davis on bail. In a 'union church,' built by himself at his home in Peterboro, N. Y., he preached as an independent layman—his opinions returning to substantial orthodoxy in his later years. He was a man of great geniality and benevolence, remarkable voice, and impressive presence and oratory. Among his publications were: *Speeches in Congress* (1855); *Sermons and Speeches* (1861); *The Religion of Reason* (1864); *Speeches and Letters* (1865); *Nature the Base of a Free Theology* (1867); *Correspondence with Albert Barnes* (1868), and *The Theologies.* He is said to have given away $8,000,000 of property to objects of benevolence during his life. He died in New York.

SMITH, GOLDWIN, D.C.L., LL.D.: English scholar and author: b. Reading, Berkshire, 1823, Aug. 13; d. ——. He was graduated from Oxford (University College) in 1845, became fellow of his college in 1847, was called in that year to the bar at Lincoln's Inn, in 1850 was made assistant-secretary of the royal commission on the state of Oxford University, and in 1858-66 was regius professor of modern history at Oxford. His lectures on Cromwell claimed attention and aroused controversy. In 1862-5 he co-operated with Bright in exerting his influence in favor of the American Union, by speeches, by signed articles, and by anonymous contributions on politics to the *Saturday Review*, then very powerful. From 1868 to 1871 he was professor of English and constitutional history in Cornell University, but then removed to Toronto, Canada, where he edited the *Canadian Monthly* (1872-4), and founded *The Bystander* (no longer published) and *The Week.* He was a consistent advocate of the annexation of Canada to the United States, his *Canada and the Canadian Question* (1891) being a valuable hand-book of argument. His works include: *Irish History and Irish Character* (1861); *Lectures on Modern*

History (1861); *Rational Religion and Rationalistic Objections* (1861); *Does the Bible Sanction American Slavery* (1863); *On the Morality of the Emancipation Proclamation* (1863); *The Empire* (1863); *A Letter to a Whig Member of the Southern Independent Association* (1864); *Three English Statesmen* (1867); *Reorganization of the University of Oxford* (1868); *The Irish Question* (1868); *The Relations between England and America* (1869); *A Short History of England Down to the Reformation* (1869); *William Cowper* (1880); *Lectures and Essays* (1881); *The Conduct of England to Ireland* (1882); *False Hopes* (1883); *Political Relations of Canada* (1890); *Canada and the Canadian Question* (1891); *A Trip to England* (1892); *The United States: An Outline of Political History* (1893); *Oxford and Her Colleges* (1894); *Bay Leaves: Translations from the Latin Poets* (1894); *Specimens of Greek Tragedies* (1894); *Essays on Questions of the Day* (1894); *Guesses at the Riddle of Existence* (1896); *The United Kingdom: A Political History* (1899); *Commonwealth or Empire* (1902); *In the Court of History* (1902); *The Founder of Christendom* (1903); *My Memory of Gladstone* (1904); *Irish History and the Irish Question* (1905); *Progress or Revolution* (1906); *Labor and Capital* (1907); and others. In his many contributions to periodicals he is known for his philosophical interpretation of current political and social phenomena. He writes history with great impartiality and literary skill.

SMITH, Green Clay: American congressman and Baptist clergyman: b. Richmond, Ky., 1832, July 2; d. Washington, D. C., 1895, June 29. He was graduated from Transylvania University in 1850, and admitted to the bar in 1853. In 1860 he was elected to the Kentucky legislature, but resigned this office to take active part in the civil war. He was promoted colonel in the Union army in 1862, and brigadier-general of United States volunteers in the following year. Resigning his commission he sat in the 38th and 39th congresses and in 1866 became governor of the Territory of Montana. He retired from political life to study for the ministry in 1869, was pastor of a Bapist church in Frankfort, Ky., and at the time of his death pastor of the Metropolitan Baptist Church of Washington, D. C.

SMITH, Henry Boynton, D.D., LL.D.: scholar and theologian: 1815, Nov. 21—1876, Feb. 7; b. Portland, Me. He graduated at Bowdoin College 1834, was tutor there, and studied at Andover and Bangor theological seminaries; and in Germany, at Halle and Berlin. While pastor at West Amesbury, Mass., 1842-47, he was also for two years professor of Hebrew at Andover Theological Seminary. From 1847 he was for three years professor of mental and moral philosophy at Amherst College; from 1850 five years professor of church history

in Union Theological Seminary, New York; then, till 1873, professor of systematic theology, resigning on account of ill health, but continued as emeritus professor of apologetics till his death. As moderator of the New School Presbyterian Assembly 1863, member of committee on reunion, himself preparing a doctrinal basis, and preaching and publishing on the subject, he contributed much to the reunion of the New and Old School branches in 1871. He made an able report on the state of religion in the United States, to the Evangelical Alliance at Amsterdam 1867; founded the *Amer. Theol. Review*, and edited it 1859-62, and after it was united with the *Presb. Review* till 1871.—Among his published addresses are: *Relations of Faith and Philosophy* (1849); *The Nature and Worth of the Science of Church History* (1851). *The Problem of the Philosophy of History* (1851); *The Idea of Christian Theology as a System* (1857); and *The Reformed Churches of Europe and America in Relation to Church History*. His laborious and useful work, the *History of the Church of Christ in Chronological Tables*, 4 vols., was published 1859. He revised Davidson and Hall's translation of Gieseler's *Text-book of Church History*, himself translating most of vols. IV. and V.; revised, also, Hagenbach's *History of Doctrine* and Stier's *Words of the Lord Jesus*. Articles on Calvin and leading German metaphysicians were contributed by him to Appletons' Amer. Cyc. With Prof. R. D. Hitchcock he wrote a life of Prof. Edward Robinson, and was preparing a life of Anson G. Phelps in his last days. He was a man of spiritual earnestness, of great mental candor and comprehensive scope of thought, presenting Christian truth in lines richly suggestive and with a style clear, vivid, and impressive.

SMITH, Henry Preserved, D.D.: clergyman: b. Troy, O., 1847, Oct. 23. He graduated at Amherst 1869, and at Lane Theological Seminary, Cincinnati, O., 1872; studied in Berlin University 1873-74, and in Leipsic University 1876-7; was instructor in Lane Theological Seminary 1874-76, and was appointed professor of Hebrew and Old Testament exegesis there 1877. Charges of heretical teaching were brought against him 1892 in the Presbytery of Cincinnati, and his trial began Nov. 14, the charges and specifications being grounded on a published work of his, entitled *Biblical Scholarship and Interpretation*. A vote on the charges was reached Dec. 12, when Smith was found guilty of teaching that the Holy Scriptures were not absolutely without error, and of denying the assertion of the Confession of Faith regarding their inspiration. He was suspended from the Presbyterian ministry until he should have made manifest to the Presbytery his renunciation of his errors, and his purpose no longer to propagate them. Other publications are: *Inspiration and Inerrancy* (1893); *The Bible and Islam* (1897); and *Old Testament History* (1903).

POCAHONTAS SAVING THE LIFE OF CAPTAIN JOHN SMITH.

SMITH, Isaac: 1736-1807, Aug. 29; b. Trenton, N. J. He graduated at the College of New Jersey 1755; remained there as tutor; then studied medicine and practiced till the beginning of the revolutionary war; entered the army and attained the rank of colonel; was judge of the New Jersey supreme court 1783-1801, and member of congress 1795-97; was United States commissioner to make treaty with the Seneca Indians; and at the close of his life was a bank president in Trenton.

SMITH, James: signer of the Declaration of Independence: about 1720-1806, July 11; b. Ireland. He came to America and settled in Pennsylvania 1729; was educated in Philadelphia; studied and practiced law and surveying, and engaged in iron-manufacturing; was active in ante-revolutionary movements, and raised the first volunteer regiment in Pennsylvania to oppose British oppression. He was a member of the Pennsylvania convention 1775, of the provincial conference to organize a government for Pennsylvania the same year; served in the continental congress 1775-78; and became a member of the general assembly of Pennsylvania 1780.

SMITH, Hezekiah Wright: American engraver: b. Edinburgh, Scotland, 1828. He came to America in 1833 and subsequently entered the establishment of an engraver in New York. He studied with the mezzotintist Thomas Doney, and in 1850 removed to Boston, where he worked for publishing firms. He executed plates of Daniel Webster, Edward Everett and Washington, the last being regarded the best rendering yet produced of Gilbert Stuart's 'Atheneum head.' In 1870 Smith returned to New York and seven years later established himself in Philadelphia. In 1879 he abandoned engraving and his subsequent history is unknown.

SMITH, Hoke: American lawyer and cabinet officer: b. Newton, N. C., 1855, Sept. 2. He was admitted to the bar at Atlanta, Ga., in 1873, and soon after became an active member of the Democratic party of that state. In 1887 he became the proprietor of the Atlanta *Evening Journal.* He was a delegate to the Democratic national convention in 1892, and was appointed secretary of the interior by President Cleveland in 1893. He resigned this office to resume his law practice in Georgia in 1896. In 1907 he was elected governor of Georgia and served through 1909.

SMITH, James and Horace: authors of *The Rejected Addresses:* James, 1775, Feb. 10—1839, Dec. 26; Horace, 1779, Dec. 31—1849, July 12; sons of an eminent London solicitor. James followed his father's profession, and succeeded him as solicitor to the board of ordnance; Horace adopted the profession of a stock-broker, and realized a handsome fortune, on which he retired with his family to Brighton. Both were popular and accomplished—James remarkable for his conversational powers and gayety; Horace (wealthier of the two) distinguished

for liberality and benevolence. The work by which they are best known is a small volume of poetical parodies or imitations, perhaps the best in the language. On the opening of the new Drury Lane Theatre 1812, Oct., the committee of management advertised for an address to be spoken on the occasion; and the brothers Smith adopted a suggestion, that they should write a series of supposed 'Rejected Addresses.' They accomplished their task in a few weeks—James furnishing imitations of Wordsworth, Southey, Coleridge, Crabbe, Cobbett, etc.; while Horace contributed imitations of Scott, Byron (all but the first stanza), Monk Lewis, Moore, and others. In talent, the authors were about equal; for though James had the greater number of successful imitations, the one by Horace of Scott is the most felicitous of the whole. None of the poets caricatured seem to have taken offense; and to Byron and Scott is ascribed the remark that they could scarcely believe that they had not written the addresses attributed to them. It is a curious fact in literary history that a work so exceedingly popular should have had great difficulty in finding a publisher; and that the copyright, originally offered to Murray for £20, and refused, was purchased by him 1819, after the book had run through 16 editions, for £131. The authors received more than £1,000 from the sale of the work. James was afterward an occasional contributor to periodical literature, and author of the humorous theatrical entertainments of Charles Mathews (for which he received £1,000). Horace wrote several novels—*Brambletye House, Tor Hill,* etc.

SMITH, James Francis, A.M.: American soldier: b. San Francisco, Cal., 1859, Jan. 28. He was graduated from Santa Clara College in 1878, studied law and was admitted to the bar in 1881. He was appointed colonel of the 1st California regiment in 1898, Apr., embarked in the first expedition to the Philippines, fought in the battle of Malate Trenches July 31, and at the taking of Manila Aug. 13. Soon after the capture of the city he was made deputy provost marshal of Manila. He served on the commission to confer with Aguinaldo's commission in 1899, Jan., took part in the battle of Santa Aña 1899, Feb. 5, and in March was given command of the island of Negros. He was made brigadier-general in 1899, Apr., and given command of the department of Visayas. In July he was appointed military governor of Negros; in 1900, Oct., collector of customs of Philippine archipelago; in 1901, June, associate justice of the supreme court, Philippines; in 1903, Jan., member of the Philippine commission and secretary of public instruction, which latter position he held until 1906, Sept. 20, when he became governor-general of the Philippine Islands.

SMITH, James Lawrence, M.D.: chemist and mineralogist: 1818, Dec. 16—1883, Oct. 12; b. Charleston, S.

C. He received a classical education at the Charleston College and the University of Virginia; then studied medicine, after which he spent three years in Europe. He published (1841) an important original memoir on the detection of arsenic in the human body, and began the practice of medicine in Charleston, at the same time delivering lectures on toxicology. Incidentally he studied the marl-beds near Charleston, and the climatic and other conditions requisite for the growth of cotton. He went to Turkey 1846 to introduce there improved methods of cotton-culture, but soon was appointed by the sultan's government chief mining engineer. His services were of very great value to the government; his discoveries of ores, coal, and emery made a large permanent addition to the public revenue. He returned home 1851, and for three years was professor of chemistry in the University of Virginia; and then (1854-5) held a like chair in the University of Louisville, Ky. He attended the Paris world's fair of 1867 and the Vienna world's fair of 1873, as one of the United States commissioners, on each occasion drawing up an elaborate official report on the progress of chemical industry. He made a special study of meteorites, and his collection of those bodies was scarcely equalled in America. He collected and republished his more important works (1873) under the title *Mineralogy and Chemistry, Original Researches.*

SMITH, JOHN: English adventurer in Europe, Asia, and Africa, and founder of Virginia: 1580-1631, June 21; b. Willoughby, Lincolnshire, England; son of a tenant farmer. He was a scholar in the free schools of Alford and Louth. The death of his parents, 1596, left him free to seek adventures abroad, regardless of the apprenticeship to a great merchant at King's Lynn to which he had been bound. He went through France until his money was spent, then became a soldier under Henry IV. of France, and later served in Holland. Thence he visited Scotland, and returning home shut himself up in a hermitage, where he studied Marcus Aurelius and Machiavelli's *Art of War.* Setting out again to seek service against the Turks, he wandered across France from Picardy to Marseilles, and there took ship for Italy with pilgrims going to Rome, who cast him overboard, for a Jonah of heresy. Saving himself by swimming to an islet rock in the sea, he was picked up by a ship of Alexandria; and visited Egypt and the Levant. Returning, and having gone ashore in Italy, he went through Tuscany to Rome, saw Pope Clement VIII. at mass, wandered as far as Naples, and thence going north, through Tuscany and Venice, he came to Gratz in Styria. Here he got news of the Turks swarming through Hungary; and, at Vienna, enlisted under the emperor, for service in the wars 1601, 2. After many adventures, a great battle (1602, Nov. 18, at Rothenthurm, a pass in Transylvania) left him wounded and a prisoner, to be sold for a

slave at Constantinople. There a lady whose servant he became fell in love with him, and the pasha, her brother, made it the occasion of wantonly maltreating him, until Smith knocked his brains out with a thresher's bat, and by riding many days through the desert escaped to a military post on the Don. Passing through Hungary and Austria, he came to Leipzig, 1603, Dec., and thence to England.

From 1605 Smith was among the most ardent seekers of adventures in the new and strange America. After the failure of his plan to send a colony to South America he became one of the founders of the London Company for colonizing s. Virginia, and 1606, Dec. 19, sailed from London as one of the colony, whose course was first to the West Indies, 1607, Mar. 24. Here some trouble caused Smith to be tried for conspiracy, but he was released after the gallows had been set up for hanging him. The expedition sailed north, and, being caught in a gale, was blown into the mouth of Chesapeake Bay, and made land 1607, Apr. 26. Although Smith was named, in the orders then opened, one of the council for government of the colony, he was kept under restraint 13 weeks in all, but on fully establishing his innocence was adjudged to be paid £200 as damages, and admitted to the council 1607, June 20; and till 1609, Oct. 4, when he finally left Virginia for England, he was more than all others the staff of the colony. Extreme privations caused the death of 67 out of 105 colonists between 1607, June 22, and 1608, Jan. 8; and the winter after Smith left the colony, all but 60 out of 490 perished in 'the starving time,' 1609, Oct.—1610, Mar. The judgment and energy of Smith in procuring food and keeping down disorder were mainly instrumental in saving the colony from the destruction which had overtaken those planted earlier by Sir Walter Raleigh. It was on an expedition to explore, and to secure corn, 1607, Dec. 10—1608, Jan., that Smith first saw Pocahontas (q.v.), who became by marriage to a colonist one of the founders of Virginia. The great services of Smith brought him to the presidency of the colony 1608, Sept. 10; and through the spring and summer of 1609 he administered affairs with remarkable success, both in subjecting the Indians and in getting supplies of food. But the arrival, 1609, Aug. 11, of a new company of 500, sent out in June in nine ships, overthrew his authority, and brought great disorder, compelling him to return to England Oct. 4. The period 1610-17 he spent in discovery of the extended coast from Virginia n. to Canada, at the same time fishing for cod and bartering for furs. At his solicitation, the long coast and regions behind it, known before as N. Virginia, received from Prince Charles the name New England; and to various points names were given, of which three adhered later—Plymouth, Charles River, and Cape Ann. In connection with two unsuccessful attempts to settle a colony, 1615 and 17, on the New England coast, Smith

was given the title Admiral of New England. He tried 1618 to secure the patronage of Lord Bacon, but without success; and 1619 he offered to lead the Pilgrim Fathers to New England, but was not accepted. Smith died in London, and was buried in St. Sepulchre's Church.

The story and character of Smith have been subjected to severe criticism by several American historians and scholars, some of whom have greatly discredited both; while the more judicious, as Palfrey and Tyler, though admitting, what can hardly be questioned, the untruth and extravagance of many portions of the story, come to a mostly favorable conclusion in regard to the man himself. Much that he wrote was retouched for the public, according to Mr. Palfrey's view, to improve the interest of the story, and, whether by others or by Smith himself, it was after the manner of the times. The character of Smith especially gains on scrutiny of all the evidence, and a large basis of fact underlies the marvels of his story.

Edward Arber's reprint of the *Works* of Smith (Birmingham, Eng., 1884) fully represents the man and his writings. The separate titles and dates of the original publications were: *A True Relation of Virginia,* 1608; *A Map of Virginia,* 1612; *A Description of New England,* 1616; *New England's Trials,* 1620, 2d ed. 1622; *The General History of Virginia, New England and the Summer Isles,* 1624; *An Accidence for all Young Seamen,* 1626; the same recast as *A Sea Grammar,* 1627; *The True Travels, Adventures, and Observations of Captain John Smith, in Europe, Asia, Africa, and America, from 1593 to 1629,* 1630; and *Advertisements for the Unexperienced Planters of New England,* 1631. The *True Relation,* the *Description of New England,* and the *Advertisements* were reprinted in Boston 1865-6. At his death the indefatigable navigator and traveler was contemplating a *History of the Sea.*

SMITH, John Blair, D.D.: 1756, June 12—1799, Aug. 22; b. Pequea, Pa.: college president and pulpit orator. Graduated at Princeton, he studied theology under his brother, Dr. Samuel Stanhope Smith, whom he succeeded as president of Hampden Sidney College 1779. After a pastorate in the Third Presbyterian Church, Philadelphia, 1791-95, he became first president of Union College 1795, returning four years later to his church in Philadelphia. He was grandfather of Major-General Charles F. Smith, notable in the civil war. His fame was great as a pulpit orator, but he published little besides a sermon, *The Enlargement of Christ's Kingdom* (1797).

SMITH, John Cotton, D.D.: Protestant Episcopal clergyman: 1826, Aug. 4—1882, Jan. 9; b. Andover, Mass.; son of Thomas M. Smith, president of Kenyon College; grandson of Professor Leonard Woods; great grandson of Cotton Mather Smith (q.v.), and descendant of John Cotton and Cotton Mather. He graduated at

Bowdoin College 1847; was rector in Bangor 1850-52; assistant at Trinity Church, Boston, 1852-59; and rector of the Church of the Ascension, New York, 1860-82. He was a noted preacher, and a leader in the liberal administration of the polity of his communion; prominent in religious and philanthropic enterprises, e.g., tenement-house reform; and was held in high regard in all denominations. He edited *Church and State.*—His publications include *Miscellanies, Old and New* (1876); Brier Hall *Lectures on Present Aspects of the Church* (1881); and many essays, on such subjects as the liturgy as a basis of union, the charity of truth, the church law of development, the Homeric age, the United States a nation, and evolution in its theistic bearings. He died in New York.

SMITH, JOHN COTTON, LL.D.: statesman: 1765, Feb. 12—1845, Dec. 7; b. Sharon, Conn.; son of Cotton Mather Smith (q.v.). He graduated at Yale 1783, practiced law in his native place, was for some years member of the Connecticut legislature, of which he was speaker 1800, after which he was in congress six years. In 1809 he became judge of the supreme court of Connecticut; then lieutenant-governor, and governor 1813-18. In congress he was chairman of the committee of the whole in the debates at the beginning of the 19th c. relative to the federal judiciary. He was president of the American Board of Missions and of the American Bible Society, and was known in many lines of benevolence.. See his *Correspondence and Miscellanies,* by W. W. Andrews (1847).

SMITH, JOHN EUGENE: soldier: b. Berne, Switzerland, 1816, Aug. 3. He removed to Philadelphia in early youth, received an academic education, and engaged in the jewelry business. In 1861 he entered the Union army as colonel of the 45th Illinois infantry; 1862, Nov. 29, was promoted brigadier-general volunteers; 1865, Jan. 12, brevetted major-general; 1866, July 27, appointed colonel 27th U. S. infantry; 1867, Mar. 2, brevetted major-general U. S. A.; 1870, Dec. 15, transferred to 15th infantry; and Dec. 20 to 14th infantry; and 1881, May 19, was retired. He distinguished himself at Forts Henry and Donelson, Shiloh, Corinth, Vicksburg, Mission Ridge, and in the Atlanta and Carolina campaigns.

SMITH, JOHN PYE, D.D., LL.D.: British Congregational minister and author: 1774, May 25—1851, Feb. 5; b. Sheffield, England. After a course at Rotherham College, he was professor of theology at Hamerton College 1805-50. He attained high repute for learning, including science and German theological thought, and incurred some odium at a time when natural science was regarded as tending toward infidelity.—He published *Scripture Testimony to the Messiah,* 2 vols. (1818-21); *The Sacrifice and Priesthood of Jesus Christ* (1828)—a defense of the evangelical view; *Scripture and Geology* (1839); and *First Lines of Christian Theology* (1854)—a syllabus of

his class lectures, printed posthumously. A memoir of him was published 1853. He died at Guilford, Surrey.

SMITH, JOHN TALBOT, LL.D.: American Roman Catholic clergyman, author and lecturer: b. Saratoga, N. Y., 1855, Sept. He was graduated from St. Michael's College, Toronto, Ontario; was engaged in missionary work in the Adirondack regions 1881-9; was editor of the New York *Catholic Review* 1889-92. He has published *A Woman of Culture* (1881); *His Honor the Mayor* (1891); *Saranac* (1893); *Brother Azarias* (1897); *Lenten Sermons* (1899); *The Black Cardinal* (1900); *The Man who Vanished* (1904); *The Closed Road* (1906); *History of the Catholics of New York* (2 vols., 1907), etc.

SMITH, JONATHAN BAYARD: 1742, Feb. 21—1812, June 16; b. Philadelphia, Pa.: civil and military officer. He graduated at Princeton 1760; was secretary of the committee of safety 1775; member of the continental congress 1777-8; lieutenant-colonel of a battalion 1777; justice of several courts 1778; auditor-general of Pennsylvania 1794; trustee of the University of Pennsylvania from its foundation till his death. He was a high officer in the Sons of Washington and the Masonic fraternity.

SMITH, JOSEPH: 1790, Mar. 30—1877, Jan. 17; b. Boston, Mass.: rear-admiral. From midshipman in the navy 1809, he became 1st lieutenant of the brig *Eagle*, and was wounded in the battle of Lake Champlain 1814; had part on the *Constellation* in the victory at Algiers, cruising in the Mediterranean mostly, 1815-45; was made commander 1827, captain 1837, chief of the bureau of naval yards 1845-69, president of the examining board for promotions 1869-71. He was retired 1861, and appointed rear-admiral 1862. His record is one of ability and honor, as also that of his son, killed on the *Congress* by the attack of the *Merrimac* 1862.

SMITH, JOSEPH. See MORMONS.

SMITH, JOSEPH, Jr.: head of the anti-polygamy branch of Latter Day Saints or Mormons: b. Kirtland, O., 1832, Nov. 6; son of the prophet-founder Joseph Smith (see MORMONS). But 12 years of age when his father was murdered by a mob, he lived in Nauvoo, Ill., becoming a clerk, working on farms and railroads, and studying law. In 1860, having declined to recognize the existing Mormon Church, he led in a reorganization with a few followers, edited *The Saints' Herald* at Plano, Ill., made preaching tours, and settled at Lamoni, Decatur co., Ia.; where he exercises chief authority in his 'Reorganized Church of the Latter-Day Saints,' which in 1900 had 600 churches and 45,500 members, mostly in Illinois, and had by its missionaries in Utah converted 10,000 Mormons to monogamy.

SMITH, JOSEPH FIELDING: American religious leader. president of the Church of Jesus Christ of Latter Day

Saints, nephew of Joseph Smith (1805-44): b. Far West, Caldwell co., Mo., 1838, Nov. 13. His childhood was spent amid persecutions and hardships, which finally resulted in the martyrdom of his uncle and his father in Carthage, Ill., 1844, June 27. In 1846 his mother with her family left her home in Nauvoo, Ill., as an exile, with the majority of the Latter Day Saints, who were driven from their homes. In this exodus, Joseph drove an ox-team to Winter Quarters, on the Missouri river, where the family remained until the spring of 1848, when they continued their journey to the West. From Winter Quarters to the Salt Lake Valley, Joseph drove two yoke of oxen attached to a heavy-laden wagon, a distance of more than 1,000 miles, and arrived in the valley 1848, Sept. 23. He was engaged in manual labors 1848-54, and in the last named year went as a missionary to the Hawaiian Islands, where he remained until 1857, gaining a thorough knowledge of the native tongue. He returned to Utah in 1858 and on March 21, 1858, was ordained to the office of a Seventy and on Oct. 16 of the same year to the office of a High Priest and member of the High Council of the Salt Lake Stake. He labored as a missionary in Great Britain 1860-3 and in 1864 returned to the Hawaiian Islands on his second mission, where he resided until his return to Utah in 1865. While on his third mission to the Hawaiian Islands, 1885-7, he became acquainted with Professor L. L. Rice, the possessor of the original manuscript of the much famed *Spaulding Story* which many over-zealous anti-Mormons have tried in every possible way to connect with the Book of Mormon, and from him he obtained an exact copy of the manuscript, which has since been published in book form. On July 1, 1866, he was ordained an apostle and was received into the quorum of the Twelve Apostles, 1867, Oct. 6. In February, 1874, he started on his second mission to Europe, this time to preside over the European mission and to edit the *Millennial Star,* the Church periodical in England. He remained there until the fall of 1875, when he returned to Utah and was appointed to preside over the Latter Day Saints in Davis County. This position he held until the spring of 1877, when he was again appointed to preside over the European mission, and for the third time left for Great Britain. He traveled in this field, visiting the different branches in England and on the Continent, until the death of President Brigham Young, 1877, Sept. 29, when he was called home. He was second counsellor to the presidency 1880-1901, and first counsellor April, 1901, to Oct. 10, 1901. On the last named date he was chosen president of the Church.

President Smith's civic record comprises the offices of territorial legislator, city councillor, and university regent, in all of which he served repeatedly. As a member of the municipal government he was the main mover in securing for the heirs of President Brigham Young

Liberty Park and Pioneer Square as public parks for Salt Lake City. He was a member of the House of the Utah legislature, 1865, and in 1882 was a member of the legislative council, presiding over it at the latter session. He was also president of the constitutional convention held the same year. He assisted in the organization of Zion's Coöperative Mercantile Institution, Zion's Savings Bank & Trust Co., the State Bank of Utah, and the Utah Sugar Co., over all of which he is now the president. He is also president of the Consolidated Wagon & Machine Co., the Utah Light & Power Co., and is connected with many other concerns.

In the auxiliary organizations of the Church he is the head of the Young Men's Mutual Improvement Association and the Deseret Sunday School Union, and is the senior editor of the *Improvement Era* and the *Juvenile Instructor,* the official organs of these two organizations of young people of the Church.

SMITH, JOSEPH LINDON: American artist: b. Pawtucket, R. I., 1863, Oct. 11. His art studies, begun at the Meseum of Fine Arts in Boston, were continued at the Académie Julien in Paris. His best work includes mural decorations in the Boston Public Library and in Horticultural Hall, Philadelphia.

SMITH, JULIA HOLMES: American physician; b. Savannah, Ga., 1839, Dec. 23. She began the study of medicine in 1873 at the medical school of the Boston University and graduated from the Chicago Homœopathic College in 1877. Since then she has practiced in Chicago and contributed to medical literature. Upon appointment by Gov. Altgeld she became the first woman trustee of the University of Illinois. She has been professor of gynecology and dean of the National Medical College superintendent of the Department of the Northwest, New Orleans Cotton Exposition, 1885, and vice-president Homœopathic Congress, Columbian Exposition, 1892-3. She organized and was first president of the Woman's Medical Association.

SMITH, JUNIUS, LL.D.: 1780, Oct. 2—1853, June 23; b. Plymouth, Mass.: first experimenter in Atlantic navigation by steam alone. Graduated at Yale 1802, he practiced law in New Haven; and in successful prosecution against the British govt. of a claim for capture of an Amer. ship, he became interested in commerce, in which he engaged. He first projected ocean steamships 1832 (a sail-and-steam ship, Capt. Rogers, having crossed the Atlantic 1819); and he demonstrated their possibility by the voyage of the *Sirius* 1838. Failing to make his British and American Steamship Co. profitable (organized 1836), he turned his attention to cultivating the tea-plant in South Carolina, but died in Astoria, N. Y., before his project was fulfilled.

SMITH, MELANCTON: naval officer: b. New York, 1810, May 24; d. 1893, July 19. He entered the U. S. navy as

midshipman 1826; was commissioned lieut. 1837, commander 1855, capt. 1862, commodore 1866, and rear-admiral 1870; was chief of the bureau of equipment and recruiting 1866-70, and was retired 1871, May 24. During his naval career he was on sea service 19 years 2 months, shore or other duty 17 years, and was unemployed 28 years 8 months. His services during the civil war were especially brilliant at New Orleans, Fort Hudson, Fort Fisher, and off N. C. After his retirement he was gov. of the Naval Asylum at Philadelphia.

SMITH, Morgan Lewis: 1822, Mar. 8—1874, Dec. 29; b. Oswego co., N. Y.: soldier. In 1846, while living in New Albany, Ind., he enlisted as a private in the U. S. army, and for bravery in Mexico was promoted sergt., soon afterward resigning and engaging in steamboat navigation. In 1861 he entered the Union army as col. of the 8th Mo. Inf., commanded a brigade at Fort Donelson and at Shiloh; was at Corinth, Russell House, Holly Springs, and Memphis; promoted brig.gen. vols. 1862, July; made commander of 2d division of Sherman's army 1862, Nov.; wounded at Vicksburg Dec. 28; and was military governor of Vicksburg after its fall. After the war he was U. S. consul at Honolulu, declined appointment as governor of Colorado, and engaged in business in Washington.

SMITH, Munroe, ll.d.: American political scientist: b. Brooklyn, N. Y., 1854, Dec. 8. He was graduated from the Columbia Law School in 1877; he then studied abroad, receiving the degree of J.U.D. (doctor of laws) from the University of Göttingen. On his return from Germany in 1880 he was appointed instructor in the department of history at Columbia University, in 1883 became adjunct professor of history, and in 1891 professor of Roman law and comparative jurisprudence. He was one of the founders of the *Political Quarterly* in 1886, of which he has since been the editor. He has edited *Selections from Cicero*, in *The World's Best Books* (1900); and has written *Bismarck and German Unity* (1898); *Germany in the 19th Century* (1901); and numerous historical and legal articles for encyclopedias and periodicals.

SMITH, Orlando Jay: American soldier and journalist: b. near Terre Haute, Ind., 1842, June 14; d. Dobbs Ferry, N. Y., 1908, Dec. 20. He was graduated at Asbury, now De Pauw University, and served with distinction in the federal army during the civil war. Till his death he was editor of the *Terre Haute Mail*, *Terre Haute Gazette*, *Terre Haute Express*, and the *Chicago Express*, and published *A Short View of Great Questions* (1899); *The Coming Democracy* (1900); *Eternalism* (1902); *Balance* (1904); etc.

SMITH, Persifer Frazier: 1798, Nov.—1858, May 17; b. Philadelphia; soldier. He graduated at the Coll. of N. J. 1815; studied law, removed to New Orleans, and became adjt.gen. of La. In the Seminole Indian cam-

paigns in Fla. 1836 and 38 he was col. of Louisiana volunteers; at the outbreak of the Mexican war he was appointed col. of a rifle regiment; and during the war was brevetted brig.gen. and maj.gen. U. S. A. for gallantry at Monterey and at Churubusco and Contreras. In 1847 he was U. S. commissioner to arrange an armistice with Mexico, and was appointed civil and military governor of Mexico City; 1848 was governor of Vera Cruz; subsequently commanded the departments of California and Texas; 1856 was promoted brig.gen. U. S. A.; and shortly before his death was assigned to command the Utah expedition.

SMITH, Richard Penn: American dramatist: b. Philadelphia, 1799, Mar. 13; d. Falls of Schuylkill, Pa., 1854, Aug. 12. He was the author of numerous plays, 15 of which were produced on the Philadelphia stage. Among them are *Caius Marius,* a tragedy acted by Edwin Forrest in 1831; *The Disowned* and *The Deformed,* both presented in London; *The Water Watch; The Venetians;* and *The Actress of Padua.* A selection of his *Miscellaneous Works,* collected by his son Horace Wemyss Smith, and including a biographical sketch, was published in 1856; and *Complete Works* with sketch and memoir was published by his son in 1888 (four vols.). Consult Rees, *Dramatic Authors of Philadelphia.*

SMITH, Richard Somers: American educator: b. Philadelphia, Pa., 1813, Oct. 30; d. Annapolis, Md., 1877, Jan. 23. He was graduated from West Point in 1834, served on topographical duty, and resigned in 1836. He was reappointed to the army in 1840, and became instructor at West Point, which position he held until 1855, when he again resigned, serving successively as professor of mathematics in the Brooklyn Institute of Technology and as a director of Cooper Institute, New York. In 1861 he was appointed to the federal army for a third time; he served, as major of infantry, until after the battle of Chancellorsville, when he resigned his commission and accepted the presidency of Girard College, Philadelphia. He relinquished this in 1867; in 1870 was appointed professor of mathematics at the United States Naval Academy, and in 1873 was transferred to the department of drawing. His publications comprise a *Manual of Topographical Drawing* (1853), and *Linear Perspective* (1857).

SMITH, Robert Payne, d.d.: British orientalist: b. Gloucestershire, England, 1818. He graduated at Oxford 1841, receiving a Sanskrit and a Hebrew scholarship, and was appointed assistant librarian of the Bodleian. In 1865 he was made regius professor of divinity, and 1871 dean of Canterbury. He is regarded as profound in oriental languages, including Arabic, and as a most erudite biblical commentator. He published an elaborate Latin catalogue of Syriac MMS., translated *Cyril of Alexandria's Commentary on St. Luke's Gospel; Ecclesiastical*

Hist. of John of Ephesus (1860); *Thesaurus Syriacus* (1868-86); *Messianic Interpretation of the Prophecies of Isaiah* (1862); *Prophecy as a Preparation for Christ* (1869); and he contributed commentaries to various works—on Jeremiah to the Speaker's Bible; on Genesis to Bp. Ellicott's commentary; on Samuel to the Pulpit commentary; on Isaiah to that of the Soc. for Promotion of Christian Knowledge; and prepared a paragraphic Bible for the same society. He was a member of the Old Testament revision committee.

SMITH, SAMUEL: 1752, July 27—1839, Apr. 22; b. Lancaster, Penn.: revolutionary soldier. He acquired a commercial education in his father's counting-room in Baltimore; was appointed capt. in Smallwood's Md. regt. 1776, Jan.; took part in the battles of Long Island, Harlem, and White Plains, and in the retreat through New Jersey; was promoted maj. 1776, Dec., and lieut.col. 4th Md. regt. 1777; and was in the attack on Staten Island and at the battle of Brandywine. Placed by Washington in command of Fort Mifflin, he held the works under almost continuous fire from 1777, Sep. 26, till Nov. 11, when he was severely wounded. Congress voted him a sword and its thanks for his heroic defense. After Valley Forge and Monmouth, Smith resigned from the army, but was active in the Md. militia till the close of the war. Politically, he was a member of the Maryland constitutional convention 1776; congress, 1793-1803 and 1816-22; U. S. senate, 1803-15 and 1822-33; and mayor of Baltimore 1835-38. He was also maj.gen. of militia at the defense of Baltimore 1814.

SMITH, SAMUEL FRANCIS, D.D.: American Baptist clergyman and poet: b. Boston, Mass., 1808, Oct. 21; d. there 1895, Nov. 16. He was graduated from Harvard in 1829, from Andover Theological Seminary in 1832, and was ordained in 1834. He was engaged in various pastorates in 1834-54, at the same time acting as professor of modern languages at Waterville College (Colby University) in 1834-42, and as editor of the Boston *Christian Review* in 1842-8. He was editor of the publications of the Baptist Missionary Union in 1854-69, and in 1875-6, 1880-2, he visited the chief missionary stations in Europe and Asia. He was famous as the author of *My Country 'Tis of Thee* (1832), which became a national hymn, and he also wrote the hymn *The Morning Light is Breaking,* at about the same time. His publications include *Lyric Gems* (1843); *The Psalmist* (1843); *Life of Rev. Joseph Grafton* (1848); *History of Newton, Mass.* (1880); *Rambles in Mission Fields* (1884); etc.

SMITH, SAMUEL STANHOPE, D.D., LL.D.: educator: 1750, Mar. 16—1819, Aug. 21; b. Pequea, Lancaster co., Penn.; son of Robert S., D.D. A precocious student, he graduated at the Coll. of N. J. (Princeton) before he was 18 years of age; assisted in his father's school; and became tutor of classics and literature in the college of his graduation,

meanwhile studying theology. Licensed to preach, he was missionary in western Virginia, where he originated Hampden Sidney College. Becoming professor of moral philos. at Princeton 1779, he was chiefly instrumental in restoring the college from the ruins of war; and afterward, 1802, collected for it $100,000 in the south, having been its president 1794-1812. His fame as scholar, orator and philosopher, was high.—He published *Essay on Causes of Variety of Complexion and Figure of the Human Species* (1787); *Sermons* (1799); *Lectures on Evidences of the Christian Religion* (1809); *Lectures on Moral and Political Philosophy* (1812); *Principles of Natural and Revealed Religion* (1815). A memoir, with sermons, was printed 1821.

SMITH, Sydney: clergyman of the Church of England; celebrated wit and humorist; original projector of the *Edinburgh Review:* 1771, June 3—1845, Feb. 22; b. Woodford, Essex. His father was an eccentric English gentleman of moderate independence; his mother was granddaughter of a French refugee; and Sydney, it was said, fairly represented both nations. He was educated at Winchester School and New College, Oxford; and wished to study for the legal profession, but found it necessary to take orders in the church, and became curate of Amesbury in Wiltshire. 'The squire of the parish,' he says, 'took a fancy to me, and requested me to go with his son to reside at the University of Weimar; before we got there, Germany became the seat of war, and in stress of politics, we put into Edinburgh, where I remained five years.' During this time he officiated in the Episc. chapel there, and published *Six Sermons* 1800. In con junction with a few accomplished literary associates—Jeffrey, Horner, Brougham, Dr. Thomas Brown, Playfair, etc.—Smith started the *Edinburgh Review,* whose first number apeared 1802, Oct., constituting a new era in periodical literature, and in independent thought and criticism in Britain. In 1803 Smith removed to London, and was soon popular as preacher, lecturer on moral philosophy (1804-06), and brilliant conversationalist—the delight and wonder of society. As a preacher, Smith was not at all 'sensational' or eccentric, though fresh and earnest. Church preferment, however, came slowly. In 1806, during the short reign of the whigs, he obtained from Lord Erskine, then lord chancellor, the rectory of Foston-le-Clay, Yorkshire; in this obscure rural parish, miles away from any educated neighbor, Smith was cheerful and faithful in all his parochial duties—winning the hearts of the humble folk. About 18 years afterward the Duke of Devonshire gave him the living of Londesborough, worth £700 per annum, to hold until Mr. Howard, son of the Earl of Carlisle, came of age. In 1828 Lord Chancellor Lyndhurst presented him to a prebendal stall in Bristol, and enabled him to exchange Foston for Combe Florey, a more desirable rectory in Somersetshire. In 1831 Earl Gray appointed him one of the canons resi-

dentiary of St. Paul's; and this completed his round of ecclesiastical preferments. He sighed for a mitre, but it never came; and Lord Melbourne is said to have regretted this omission in his career as prime minister. Smith accepted the disappointment of his expectations of a bishopric, which expectations his friends had raised, with all his characteristic good humor and cheerfulness. The writings of Smith subsequent to 1800 were his contributions to the *Edinburgh Review*, which he collected and republished with other miscellaneous works 1839; *Peter Plymley's Letters*, written 1807, to promote Rom. Cath. emancipation, and abounding in wit and irony worthy of Swift; *Sermons* in two vols., 1809; *Speeches on the Catholic Claims and Reform Bill*, 1825-31; *Three Letters to Archdeacon Singleton on the Ecclesiastical Commission*, 1837-39; *The Ballot*, political pamphlet, 1837; *Letter to Lord John Russell on the Church Bills*, 1838; *Letters on Railways*, 1842; *Letters on American Debts*, 1843, etc. Though gay, exuberant, and witty to the last, Smith suffered from periodical attacks of gout, and other ailments. Ten years after his death his daughter, wife of Sir Henry Holland, physician, published a memoir of her father, with a selection from his letters.

The works of Smith were mostly on temporary topics and controversies, yet they will probably take a permanent place in literature as specimens of clear and vigorous reasoning, rich unctuous humor, and solid good sense. His jokes, exaggerations, and ridicule all are logical, driving home his argument; and his wit was sportive, untinctured with malice.

SMITH, WILLIAM; called the Father of English Geology: 1769, Mar. 23—1839, Aug. 28; b. Oxfordshire. His profession of land-surveying led him to geological observation; and 1794 he began his map of the strata of England, and became the founder of stratigraphical science. His epoch-making Geological Map of England (see GEOLOGY) was pub. 1815. He published numerous other geological maps, received many honors, and died at Northampton.

SMITH, WILLIAM, LL.D., D.C.L.: British author of biblical and classical dictionaries: b. London 1813; d. 1893, Oct. 7. He was educated in the London University, took first prize in classics, and afterward abandoned law for ancient literature. In 1853 he was appointed classical examiner of the university; in 1869 a member of its senate; and 1867 became editor of the *Quarterly Review*. —His valuable works are: *Dictionary of Greek and Roman Antiquities* (1840-42); *Dict. of Biography and Mythology* (1843-49); and *Dict. of Classical Geography* (1852-57)—the three forming an *Encyc. of Classical Antiquity*, followed by summaries of the same for school use (1850), and a smaller summary, *Dictionary of Classical Antiquity*. He prepared also a school series of histories, namely, *History of Greece* (1853), and abridge-

ment of Gibbon (1854)—these, with Hume abridged and Liddell's Rome, reprinted as Harper's student's series; a Latin-English dictionary (1855); *Dictionary of the Bible*, 3 vols. (1860-63); *Student's Latin Grammar* (1863); principias or readers in Latin and Greek; *A Copious and Critical English-Latin Dict.;* and a large atlas of *Biblical and Classical Geography.*

SMITH, WILLIAM FARRAR: soldier: b. St. Albans, Vt., 1824, Feb. 17; d. 1903, Feb. 28; known in the U. S. army as 'Baldy Smith.' Graduated at West Point 1845, he served as topographical engineer in the lake region and on the Mexican boundary, with intervals of duty at West point as assistant professor of mathematics 1846-48 and 1855-6. From 1856 for five years he was in the lighthouse construction service, and secretary of the board 1859-61, having been promoted captain of topographical engineers 1859. After brief duty on the staff of Gen. B. F. Butler, 1861, he was col. of vols. in July; brig.gen. of vols. Aug., participating in Gen. McClellan's Virginia campaign; brevetted lieut.col. in the regular army 1862; maj.gen. of vols. the same year, leading a division at South Mountain and Antietam; and brevetted col. U. S. army. As corps commander he fought at Fredericksburg, and was made major of engineers 1863. After other service, he distinguished himself at Chattanooga, especially in the movement he made at Brown's Ferry, 'saving the Army of the Cumberland.' Subsequently he had part in the Virginia campaigns of 1864; was promoted brig. gen. U. S. army, and maj.gen., resigning from the army 1867, after which he was president of the International Telegraph Co., police commissioner of New York, and president of the police board, and following his profession of civil engineer.

SMITH, WILLIAM HENRY, D.C.L.: 1825, June 24—1891, Oct. 6; b. London, England; son of the well-known publisher and news-dealer of the same name; received a grammar-school education; and became a partner in his father's firm. He entered political life 1865, when he was defeated for parliament in Westminster as a conservative. In 1868 he defeated John Stuart Mill, and held the seat till 1885; he was then returned for the Strand district, and re-elected 1886. He was financial secretary of the treasury 1874-77; first lord of the admiralty 1877-80; secretary of state for war 1885; chief secretary for Ireland six days, and again secretary of state for war 1886; and first lord of the treasury warden of the Cinque Ports, and government leader in the house of commons from 1886, Dec. 23, till his death. He received his honorary degree from Oxford University, 1879, and was universally esteemed.

SMITH, WILLIAM ROBERTSON, D.D., LL.D.: biblical and Arabic scholar: 1846, Nov. 8—1894, Mar. 31; b. Keig, Scotland. He was educated under private tutors, then at Aberdeen University, and at Bonn and Göttingen. Elect-

ed professor of Hebrew in the Free Church (Presb.) Coll. at Aberdeen, he was removed from his chair by the general assembly 1881, in consequence of his 'higher criticism' of the Old Testament scriptures, published in his articles contributed to the *Encyclopædia Britannica* (9th ed.), and in other writings. For some years following, he assisted in editing the new edition of that encyclopedia. Meanwhile he had been also assistant professor of physics at Edinburgh 1868-70, and member of the Old Testament revision committee from 1872 In 1879-80 he journeyed in Arabia; and was made lord almoner professor of Arabic at Cambridge University 1883. He was appointed librarian of that university 1886, and Sir Thomas Adams professor of Arabic 1889. The novelty and freedom of his criticisms, as those of a British writer in orthodox ranks, have called forth strong animadversion, and have made his name widely known. His ability as scholar and writer is universally recognized.—Among his principal writings are: *The Old Testament in the Jewish Church* (1880); *The Prophets of Israel, and Their Place in History to the Close of the Eighth Century B. C.* (1882); *Kinship and Marriage in Early Arabia* (1885); *Lectures on the Religion of the Semites* (1889).

SMITH, William Sooy, a.b., a.m.: American army officer and engineer: b. Tarlton, Ohio, 1830, July 22. He was graduated from the United States Military Academy in 1853 and assigned to frontier duty. The following year he resigned his commission for more active life, and became assistant engineer of the Illinois Central Railroad. He practised the profession of an engineer in various cities of the United States until the beginning of the Civil War, when he entered the volunteer service. He was promoted brigadier-general 1862, Apr. 15, and commanded successfully the 2d division of the Army of the Ohio, the 1st division of the 16th Army Corps, and the cavalry division of the Department of the Tennessee, but was obliged to retire from active service on account of prolonged illness in 1864. His fame as an engineer rests upon his many improvements of the method of sinking foundations for the security of high buildings, and in the use of pneumatic caissons in bridge building. His name is identified with the building of the first steel bridge, a structure which spans the Missouri at Glasgow, the construction of the Wangoshanee Lighthouse in the Straits of Mackinac, the Hudson River tunnel, and other bridge and railway work throughout the United States and Canada.

SMITH, William Stephens: 1755-1816, June 10; b. New York. He graduated at Princeton College 1774, studied law, entered the army, and became lieut.col., serving successively on the staffs of Sullivan, Steuben, and Washington. In 1785 he was sent as secretary of legation to London. He was surveyor of the port of New York, member of assembly three years, congressman 1813-16. He died at Lebanon, N. Y.

SMITH COLLEGE: institution for the higher education of women; at Northampton, Mass.; founded 1875, with an endowment fund of $400,000, by Miss Sophia Smith, of Hatfield, Mass., who proposed to provide by it for young women 'means and facilities for education equal to those which are afforded in our colleges for young men.' The charter obtained by the board of trustees appointed by the founder gave the institution full powers 'to grant such honorary testimonials, and to confer such honors, degrees, and diplomas, as are granted or conferred by any university, college, or seminary in the United States.' The design of fully equalling the best colleges for young men, and thus affording the broadest and highest intellectual culture for women, was carried out in the rigorous conditions of admission, on a level with those of Harvard and Yale, and in the curriculum of studies adopted. This unsectarian college formerly conferred degrees of A.B., B.L., and B.S, but now only one degree is given, that of A.B. The course includes one year's work in 8 required subjects, including bible study. The curriculum embraces music and art. A certain amount of technical work in each department, when combined with theoretical courses, counts toward qualification for the degree. 29 scholarships are provided. Fellowships are given for advanced work in philosophy, psychology, botany, and zoology. Physical training is imperative. There are 10 buildings, including the Lilly Hall of Science, the Hillyer Art Gallery, the Observatory, and the Lyman Plant House.

The prescribed studies of all the courses are such as are deemed necessary to give them distinctive character and to secure unity and consecutiveness. The plan is meant to afford enough prescribed work to insure a high grade of scholarly culture, while elective studies are introduced to meet the demand of individual tastes. The studies in art and music are offered as electives in the academic courses, and they may be taken in any year. There are, also, special schools of music and of art. The school of music is in Music Hall, with ample accommodations for practice, lectures, and public performances. The regular course of study covers three years, and to those who complete it the degree Bachelor of Music is given. The school of art, for which Mr. Winthrop Hillyer provided the Hillyer Art Gallery and an endowment of $50,000 for perpetual increase of the art collection, has a regular course of study extending through four years. It furnishes practical and theoretical instruction in the principles of the arts of design—drawing, painting, and sculpture, including the elements of architectural styles and decoration.

For 1906 the total students numbered 1,033, professors and instructors 98; volumes in the library 7,000; scientific apparatus valued at $112,166; grounds and buildings, $650,000; and productive fund $1,078,000.

The academic build. are: (1) College Hall, for lecture

and recitation rooms; including Social Hall, reading-room, library, and offices for instructors; (2) Music Hall, with all the best modern appliances and facilities for work in vocal and instrumental music; (3) Hillyer Art Gallery, provided with studios and exhibition-rooms, and containing extensive collections of casts, engravings, and paintings, serving to teach the history and characteristics of ancient and modern art; (4) the Observatory, furnished with an equatorial telescope of 11 inches aperture, a spectroscope with diffraction grating, a sidereal clock, a chronograph, a portable telescope, and a meridian circle of four inches aperture; (5) Lilly Hall of Science, given by Alfred Theodore Lilly, at a cost of $60,000, and providing ample accommodation for the scientific work and collections—the first floor and basement containing lecture-room and laboratories for chemistry and physics, and the scientific library; the second floor having the biological and geological laboratories and class-rooms; and the collections occupying the whole third floor. A gymnasium-building, with dressing-rooms, bowling-alleys, and a hall arranged for exercise and indoor sports, has served until 1891. A new and larger gymnasium is now provided, with swimming-bath and Swedish apparatus. A specialist examines each student, and prescribes proper exercise.

A special feature, adopted at the organization of the institution, is that of commodious dwelling-houses, each with its own parlor, dining-room, and kitchen, as well as the ordinary students' rooms, in which a group of students, presided over by a lady, may form a family, in which intellectual discipline is combined with the culture of a refined home. The charge for board and furnished rooms in these college-houses is $250 a year; that for tuition of all students, regular, special, and graduate, is $100 a year. Religious culture, by daily worship, by attendance on Sunday at one of the churches of the town, by a systematic critical study of the Bible, and by the general influences of the institution, has been secured to a remarkable degree, with entire personal and intellectual freedom. The town chosen for the site of the college, and the situation secured for its buildings, combine advantages peculiarly favorable. Few American towns surpass it in natural attractions, or in the intelligence and refinement of its people, and the interest of its historical associations. In addition to a town library of more than 20,000 vols., with its permanent endowment fund of $50,000, a new library with 6,000 volumes has been provided for, with an endowment of over $300,000; and in the college buildings there are good reference-libraries for special student use. Aid is given to students otherwise unable to go through college by means of annual scholarships of $100 and $50 each; and four endowed scholarships are awarded.

SMITH'FIELD: a historic square in London, a little north of Newgate and west of Aldersgate, which was until 1855 the only cattle market in London. It was outside the old city walls, and in the 11th c. was an open spot where the citizens delighted to promenade. Before the days of Tyburn, Smithfield (now called West Smithfield to distinguish it from East Smithfield, Tower Hill) was the place of public execution. Here Sir William Wallace, and Mortimer, Earl of March, suffered death; here Walworth, the mayor, stabbed Wat Tyler; and here Jack Straw was hanged. Tournaments were held on this spot; Edward III. celebrated the deeds of Cressy and Poitiers by mimic feats of arms here; and here Richard II. gave a three days' tournament to celebrate his marriage. A more terrible page of history tells of the murders by way of burning which took place here in the name of religion. Bartholomew Fair, so often mentioned in literature, was held at Smithfield. We find mention of a cattle market having been held here as far back as 1150. The corporation had official control over the market for above 500 years, dating from 1345.

SMITHSON, JAMES: founder of the Smithsonian Institution at Washington; b. Weston, Super-Mare, Somerset, England, about 1765; d. Genoa, Italy, 1829, June 27. His mother at the time of his birth was the widow of James Macie, a country gentleman of an old family. Smithson describes himself in his final will as 'son to Hugh, first Duke of Northumberland, and Elizabeth, heiress of the Hungerfords of Studley, niece to Charles the Proud, Duke of Somerset.' Smithson seems himself to have observed no reticence about what he thought the true facts of his birth, but the name of Macie appears to have been imposed upon him from his youth by his parents, and his feeling that he must create for himself a position which his birth had denied him, is perhaps a reason for his subsequent bequest to the United States of the means which founded the institution bearing the name which he had later assumed, and which was the family name of Sir Hugh Smithson, the first Duke of Northumberland. It cannot but be supposed that something of this kind was in his mind when he wrote 'My name shall live in the memory of man when the titles of the Northumberlands and the Percys are extinct and forgotten.'

Nothing material is remembered of his life at Oxford, where he entered under the name of Macie as a gentleman commoner in 1782, though he appears to have been partly occupied in chemistry, which was the scientific interest of his later life, and this at a time when the study of physical science was almost unknown in the university. He was graduated at Pembroke College with the degree of master of arts in 1786, and was admitted as a fellow of the Royal Society in the following year on the recommendation of Cavendish and other eminent fellows of the society. Smithson published in all 27 sci-

entific papers, eight in the Philosophical Transactions between 1791 and 1807, one in the *Philosophical Magazine*, and 18 in *Thomson's Annals of Philosophy* between 1819 and 1825.

Smithson's will, dated from London, 1826, Oct. 23, is a brief document leaving his property to a nephew, and in the case of the death of the nephew without leaving a child, he adds: 'I then bequeath the whole of my property to the United States of America to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men.'

The will was proved in the Prerogative Court of Canterbury, the value of the effects being sworn to be not over £120,000, a sum much larger in relative importance at the time than it would be now. The money appears to have come from his mother's family; there is, at least, no indication that any portion whatever of the Smithson bequest was derived from his Northumberland ancestry. It is not definitely ascertained why Smithson made the United States his legatee, in which he is not known to have had any correspondent or friend.

Smithson was buried in the little English cemetery on the heights of San Benigno, the remains and monuments in which were removed by the Italian government to another location. The regents of the Smithsonian Institution, who caused a tablet to be erected to him in the cemetery and in the church, on the removal of the cemetery, appointed one of their number, Dr. Alexander Graham Bell, to bring the remains from Genoa to Washington, where they arrived in the early part of 1904, being brought from New York to Washington by order of the president of the United States upon a government vessel, and transferred from the Washington Navy Yard, under military and naval escort, to the Smithsonian building.

SMITHSONIAN INSTITUTION, THE: an establishment at Washington founded under a bequest of James Smithson (q.v.). In 1835, six years after Smithson's death at Genoa, Italy, the United States legation at London was notified that his estate, amounting in value to about £100,000, was held in possession of the accountant general of the British courts of chancery. President Jackson, in a message to Congress, dated 1835, Dec. 17, notified that body, and after considerable debate a bill was passed, and approved on the 1st of July, 1836, authorizing the president to assert and prosecute the claim of the United States to the legacy, which it is well to note was relatively far more considerable then than now, being greater than the endowment of any university or college in the country except Harvard at that time. The president selected as agent, Richard Rush, of Pennsylvania, who proceeded to London and entered a friendly suit in the courts of chancery, which was settled in two years. For eight years the matter was discussed in Congress, until 1846, Aug. 10, an act which had passed

JAMES SMITHSON, AS AN OXFORD STUDENT.
Founder of the Smithsonian Institute

both houses was approved by the president, in terms so broad as to allow for any future development of the institution along any lines of intellectual advancement.

System of Administration.—The establishment consists of the president of the United States, who is the presiding officer *ex officio;* the vice-president, the chief justice of the United States, and the members of the cabinet. In addition to the establishment, there is provided a board of regents, by whom the business of the institution is administered, composed of the vice-president of the United States, the chief justice of the United States, three members of the Senate, three members of the House of Representatives, and six citizens, two of whom must be residents of the District of Columbia, and the other four from states of the Union, but no two from the same state. The senatorial regents are designated by the president of the Senate, and those representing the House by the speaker of the House, the others being elected by Congress with the approval of the president. There is a secretary to the establishment, who is also secretary to the board of regents.

The institution occupies a building in the Mall, in the square known as the Smithsonian Park. It was planned by James Renwick, was begun in 1847, and completed in 1855.

The first secretary was Joseph Henry, distinguished in science for his epoch-making discoveries. It fell to his lot more than it could to any of his successors to determine what form the institution should take, and his 'Programme of Organization,' adopted at the outset by the board of regents as the governing policy, has been found broad enough for all future time. Upon his death he was succeeded in 1878 by Spencer Fullerton Baird, the leading authority on the natural history of America, and the founder of the United States Fish Commission; and upon his death, in 1887, Samuel Pierpont Langley was elected, who died in 1906, when C. D. Wolcott succeeded him in the position.

Important donations and bequests have been added to the permanent fund, the most notable being the gift of Thomas G. Hodgkins, of Setauket, N. Y., in 1891, to the amount of nearly $250,000, the income of $100,000 of which was to be devoted to the investigation of atmospheric air. The Institution initiated the work devolving upon it by Mr. Hodgkins' bequest by offering various prizes, including one of $10,000 for the most important discovery, within a certain period, concerning atmospheric air. This unusually large prize stimulated much activity, and was awarded to Lord Rayleigh and Professor Ramsey for the discovery of Argon.

Objects of the Institution.—The broad purposes of the Institution are named in the words of the founder—'for the increase and diffusion of knowledge among men.' This was interpreted by Henry in the following words: 'To assist men of science in making original

researches, to publish them in a series of volumes, and to give a copy of them to every first-class library on the face of the earth.' It has supplied apparatus, made grants for experiments, and furnished information to many thousands of persons. The Institution also maintains a Table at the Biological Station at Naples. It initiated, from the income of its own fund, all of the activities imposed upon it by the fundamental act, though as these gradually grew beyond this income, they were greatly aided by appropriations from Congress, through which the various bureaus are at present maintained.

Publications.—There is no restriction as to the subject of publications, and they consist of memoirs upon archæology, astronomy, ethnology, botany, zoology, geology, palæontology, meteorology, magnetics, physics, physiology, and philology, and many other branches of investigation.

Library.—These publications have been, since the beginning, distributed throughout the world, mostly to scientific and literary establishments and libraries; and in return the Institution has received the publications of like organizations, forming a collection of books which in the departments of publications of learned societies and periodicals is one of the richest in the world. In 1865 the library was deposited with the Library of Congress and is now installed in a special hall upon the second floor of the new Library building. A working library of some 20,000 volumes has gradually grown up in connection with the Institution and its dependencies. Much attention was given to cataloguing and bibliography by the first assistant secretary of the Institution, Charles C. Jewett. Henry likewise was greatly interested in this subject, and it was due to his initiative that the Royal Society of London took up its catalogue of scientific memoirs, which has since developed into the International Catalogue of Scientific Literature. For this latter work the Smithsonian Institution is the representative of the United States.

The collection of objects of art was one of the original purposes of the Institution, though it has been to some extent held in abeyance. The valuable collection of prints and art books of George P. Marsh was, however, purchased, and a room devoted to prints and art books is set aside in the Smithsonian building.

National Museum.—The Smithsonian Institution is the only lawful custodian of 'all objects of art and of foreign and curious research, and all objects of natural history, plants, and geological and mineralogical specimens belonging, or hereafter to belong, to the United States, which may be in the city of Washington.' Out of this provision in the fundamental act there grew the National Museum. The fundamental act was supplemented by an act of Congress, approved in 1880, which provides that 'all collections of rocks, minerals, soils,

SMITHSONIAN INSTITUTION, WASHINGTON, D. C.

fossils, and objects of natural history, archæology, and ethnology, made by the Coast and Interior Survey, the Geological Survey, or by any other parties for the government of the United States, when no longer needed for investigations in progress, shall be deposited in the National Museum.' The nucleus of the Museum was the cabinet of minerals of Smithson, the results of the Wilkes exploring expedition, and the national cabinet of curiosities which had been kept in the Patent Office. Its collections are kept in the greater part of the Smithsonian building and in the so-called National Museum building erected in 1881. Since that year over 5,000,000 persons have visited the Museum building, and nearly 3,000,000 persons the Smithsonian building.

Bureau of American Ethnology.—This bureau is an outgrowth of researches beginning early in the history of the Institution, whose first publications in the series, *Contributions to Knowledge,* was on *Ancient Monuments in the Mississippi Valley,* by Squier and Davis. In its present form the work of the Bureau was commenced in 1872 by Major J. W. Powell, at the request of the Commissioner of Indian Affairs, who desired trustworthy information concerning the affinities of the Indian tribes. In 1879 the Bureau was definitely organized under the direction of the Smithsonian Institution, and Major Powell was made director, serving in that capacity until his death in 1902. The Bureau has engaged in researches in the languages, habits, customs, tribal organization, government, myths and ceremonies of the American Indians, and it is proposed to summarize this material in a cyclopedia of American Indians, shortly to be published. It has also issued the voluminous publications already alluded to, which contain information of importance with regard to the political dealings of the United States government with the Indian tribes.

Astrophysical Observatory.—The Astrophysical Observatory was established in 1890 under the immediate direction of the present secretary. It has been devoted in the main to researches in regard to that invisible portion of the solar spectrum which lies beyond the limit of the red. This work, first rendered possible by Mr. Langley's invention of the bolometer, has been carried still further, resulting in a great map of the infra-red solar spectrum completed in 1899, which extends our knowledge of the spectrum to many times that known to Newton. It is believed that these studies will prove of great practical importance since they have to do with that region of the spectrum which includes the greater portion of the energy of the sun, which through its heat affects climate and crops. Important expeditions were sent out in 1900 and 1901 to observe the total solar eclipses of those years, and especially valuable results were obtained at that of 1900, including photographs of the solar corona of unexampled size and excellence.

National Zoological Park.—The National Zoological Park was established by Congress in 1890 at the initiative of the present secretary, to secure the preservation of such American animals as are upon the verge of extinction, and also for the pleasure and instruction of the people. The park is situated upon Rock Creek, 2 m. n. of the centre of the city, and has an area of 167 acres, being four times as large as the Zoological Garden at London. It is amply supplied with water, and its surface is of a varied and picturesque character. The collection comprises about 1,000 animals, mostly American species.

International Exchanges.—The system of International Exchanges, begun in 1850, was designed for a free interchange of publications between men of science in various parts of the world. It established a body of correspondents which now numbers nearly 44,000, mostly abroad. In 1867 Congress assigned to the Institution the duty of exchanging for the benefit of the Library of Congress, 50 sets (a number since increased to 100) of all government publications, and in 1889 a treaty was entered into between the United States and other countries, in which this entire matter of exchange of scientific and government publications was fixed.

Summing up what has been said about the Smithsonian Institution, we see that it occupies the exceptional position of a ward of the government, its regents expending its own income, which is largely supplemented by direct government grants for its museum and other bureaus; while through its extended system of publications, its library and its means for encouraging research and diffusing knowledge, through a body of over 30,000 correspondents abroad and approximately half that number at home, it occupies its actual place in the scientific activities of the day.

SMITHSONITE, n. *smĭth'sŏn-īt* [after the chemist James *Smithson*]: in mineralogy a name applied to carbonate of zinc. It occurs in crystallized forms of the rhombohedral system, with perfect cleavage. Also as reniform, botryoidal, and stalactitic masses. In the purer forms it has a vitreous lustre inclining to pearly, with the color varying from white to grayish, greenish, or brownish, a white streak, and a translucent to almost transparent character. Its hardness is 6 per cent the scale, and its specific gravity 4 to 4.45.

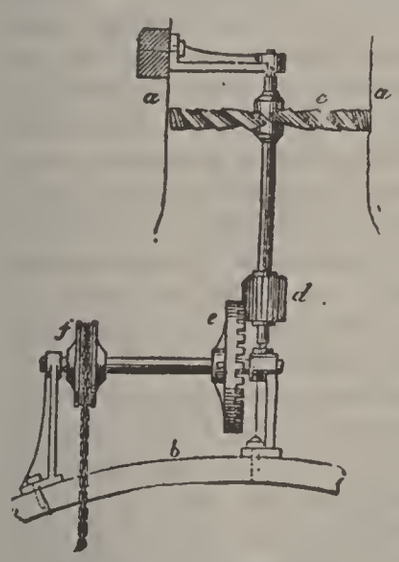
SMITH SOUND: a passage of water at the northern extremity of Baffin bay, between Peary Land, in Greenland, and Ellesmere Land. It leads from Baffin bay into Kane Basin, a body of water about 110 m. long. Its southern entrance was discovered by Baffin in 1616. In 1854 it was surveyed by a United States expedition under Dr. Elisha Kent Kane.

SMITT, n. *smĭt* [Ger. *schmitz*, a stain: AS. *smittian*, to spot (see also SMUT)]: very fine clayey iron ore, made into balls for marking sheep.

SMITTEN, v. *smĭt'n:* see under SMITE.

SMOCK, n. *smŏk* [Icel. *smokkr*, a shirt without arms; *smokka*, to stick in: in Heligoland, *smock*, a woman's shirt: AS. *smoc*, a garment]: a woman's under-garment; a chemise. SMOCK-FROCK, n. *-frŏk*, a loose, coarse, linen garment, worn above the dress by English farm-laborers and others; a blouse.

SMOKE, n. *smōk* [AS. *smeac;* Ger. *schmauch;* Dut. *smook*, smoke: Gr. *smūchō*, I burn in a smouldering fire: Ir. *smuid*, smoke, fume: W. *mwg*, fume]: the cloudy fumes or vapor arising from any burning substance; anything resembling smoke, as vapor: V. to apply smoke to; to cure by hanging in smoke; to scent as by smoke; to inhale and emit the fumes of tobacco; to throw off in the form of smoke; to move with such swiftness as to smoke, as a horse; to steam; to reek; to expel by smoke; in *Scrip.*, to be kindled; to burn; in *OE.*, to suffer; to be punished. SMO'KING, imp.: ADJ. emitting smoke: N. the act of throwing off smoke; the act or habit of using tobacco by burning it in a pipe or in the form of a cigar, and inhaling its fumes. SMOKED, pp. *smōkt.* SMO'KER, n. *-kĕr*, one who smokes tobacco. SMOKE'LESS, a. *-lĕs*, not throwing off any smoke. SMO'KY, a. *-kĭ*, throwing out smoke; filled with smoke. SMO'KILY, ad. *-lĭ.* SMO KINESS, n. *-nĕs*, the state of being smoky. SMOKE-BALLS, in *mil.*, hollow balls made of repeated folds of paper filled with a composition which gives out much smoke. SMOKE-BLACK, a sooty substance obtained from the combustion of certain resinous bodies, especially of pitch, used in the manufacture of printers' ink, of blacking for shoes, etc. SMOKE-BOARD, a sliding or suspended board before the upper part of a fireplace to cause an increased draught, and prevent smoke coming into the room. SMOKE-CONSUMING, a. applied to certain furnaces which consume their own smoke (see SMOKE, ABATEMENT OF). SMOKE DRY, v. to dry by smoke. SMOKE-DRIED, dried or cured by smoke. SMOKE-JACK, a contrivance to turn a spit before a fire by means of the current of ascending air in the chimney. SMOKE-QUARTZ, a mineral having a brownish smoke-colored tint, and comprising the wine-yellow and clove-brown crystals, which are the true cairngorms. SMOKE-SAIL, a small sail to protect the funnel of a ship's galley from the wind. SMOKING-ROOM, a place set apart in a hotel or other building, or on a public conveyance, for smoking tobacco in. SMOKE-STACK, in a *steam-vessel* the group of flues rising above the deck, comprising the Funnels (q.v.), and the several escape-pipes for the steam which are beside it In ships-of-war all these are frequently made 'telescopic,' that



Smoke-jack.

they may be drawn down out of danger in action or in a strong head wind. To END IN SMOKE, to become an utter failure; to fail in success after much show and parade.

SMOKE, v. *smōk* [Bav. *schmecken*, to sniff, to smell: AS. *smeagan*, to investigate: connected with SMOKE 1]: in *OE.*, to smell or hunt out; to discover anything meant to be kept secret: to detect; to find out; to expose; to ridicule. SMO'KING, imp. SMOKED, pp. *smōkt*.

SMOKE, ABATEMENT OF: consuming or straining of smoke from bituminous coal, discharged from chimneys. Bituminous coal consists of carbon, generally about 80 per cent., hydrogen, nitrogen, oxygen, and sulphur, with a varying proportion of earthy impurity, or ash. When a fire is made, two distinct processes take place: first, destructive distillation, as in the retorts of gas-works; secondly, combustion of the products of distillation. The distillation decomposes the coal, whose elements become rearranged so as to yield: (1) hydrogen, marsh-gas, carbonic oxide, olefiant gas, benzine and similar hydrocarbons, and water—all gaseous or capable of being rendered gaseous at a higher temperature, and all, except the water, combustible; 2, ammonia and other nitrogen compounds, and certain sulphur compounds, also volatile and combustible; 3. coke, consisting of carbon and ash, combustible but non-volatile. It is these products of distillation that are burned, and this second process requires the presence of air, also a temperature much higher than is requisite for the first process. With perfect combustion the only products are water vapor, carbonic acid, nitrogen, and sulphurous acid; and the water vapor contains all the hydrogen originally present in the coals, the carbonic acid contains all the carbon, the sulphurous acid all the sulphur, while the nitrogen liberated represents not only all the nitrogen in the fuel, but also all the nitrogen of the air introduced to promote combustion: these products are discharged into the atmosphere through the chimney. To insure this complete combustion, two things are needed: adequate but not excessive supply of air, and a proper temperature. Because these conditions are very seldom perfectly fulfilled, the combustion of coal is usually imperfect, and the products of distillation enter the atmosphere unburnt or only partly burnt. Usually the name smoke is applied to this mixture of hydrogen, hydrocarbons, carbonic oxide, and unburnt carbon only when it contains a sufficient amount of finely divided carbon to render it dark-colored. Thus, besides the disfigurement of cities caused by the carbon, the smoke nuisance involves an enormous waste of fuel, and its abatement is a problem not less important on economic than on sanitary and æsthetic grounds.

The sanitary codes of modern cities usually contain ordinances prohibiting the pollution of the atmosphere by smoke. The sanitary code of New York city (sec. 118) has this: 'From and after the first day of June, 1870, every furnace employed in the working of engines by steam, or in any mill, factory, printing house, dye-factory, iron-foundry, glass-house, distillery, brew-house, sugar-refi-

nery, bake-house, gas-works, or in any other buildings used for the purpose of trade or manufacture, shall be so constructed as to consume or burn the smoke arising therefrom, unless a permit to the contrary be obtained from this department.' Similar regulations exist in other principal cities of the United States. In London the smoke-nuisance is punishable with fine. Many are the methods that have been employed for abatement of the smoke-nuisance and promoting economy in the combustion of coal. At Glasgow the proprietors of certain iron furnaces receive a rental from the 'Furnace Gas Co.' for the right to collect the smoke and gases from the blast-furnaces. These are passed through several miles of iron tubing, diminishing in size from 6 ft. down to 18 in., and as the gases cool there is deposited a considerable yield of oil. At the smallest iron-works in Glasgow, the Furnace Gas Co. pump and collect about 60,000,000 cubic ft. of furnace-gas daily, and recover about 25,000 gals. of furnace-oil a week, using the residual gases, consisting chiefly of carbonic oxide, as fuel for distilling and other purposes, while a considerable yield of sulphate of ammonia is also obtained. The oil is used for 'lucigen' lamps and in treating timber for railroad ties: it can be used also as an enricher of coal gas. A simpler method of collecting the smoke and gases is described in the London *Engineer* (1891). The experimental apparatus employed consists of a fan which passes the combustion products from the fire of a portable engine into a chamber containing water. The products enter a horizontal perforated tube, partly immersed in water in this chamber and rotating at the rate of about 200 revolutions a minute. On this tube are arms carrying perforated sheet-iron, so that by the rotation of the tube and these arms the water is thrown up in fine spray, through which the smoke must pass on its way to an exit from the upper part of the chamber. Perforated plates are placed also in the upper part of this vessel, through which the escaping gases must pass, and which throw down the water. The high temperature of the products of combustion which enter this chamber causes evaporation of some of the water, which passes away as vapor at atmopsheric pressure. The smoke is robbed of all carbonaceous material, and, to some extent, of other deleterious constituents, including sulphur. These collect in the water and form a scum, which is constantly drawn off. The cost of the process is low enough to commend the system and apparatus.

SMOKE'LESS GUN'POWDER. See EXPLOSIVES.

SMOKE-TREE: an important shrub (*Cotinus,* or *Rhus cotinus*) indigenous to Europe, and also called Venetian Sumach; or the similar American species (*Cotinus cotinoides*). They are shapely, tall and much branched and have oval leaves and terminal large, loose panicles of greenish, polygamus 5-parted flowers. These are chiefly

abortive, and the long pedicels become very plumose in fruit, and seem to smother the plants as by smoke, with their feathery soft masses, which are pale green or reddish in hue. The soft orange-colored wood yields a valuable dye-stuff called young fustic, and the leaves of the European species are used in tanning.

SMOKY HILL RIVER, or SMOKY HILL FORK: the source is in eastern Colorado, and it flows into the state of Kansas through Grove, Trego, Ellis, Russell, and Ellsworth counties. About 10 m. w. of Abilene unites with the Solomon river, and forms the Kansas river. It is 400 m. long and traverses a prairie region noted for its fertility.

SMOKY MOUNTAINS, or GREAT SMOKY MOUNTAINS: on the boundary of North Carolina and Tennessee; a part of the Appalachian system. The highest peaks are Mount Guyot, 6,636 ft. high, and Clingman's Peak, 6,660 ft. high. This mountain is the scene of one of Mary Noailles Murfree's stories, *The Prophet of the Great Smoky Mountain.*

SMOKY QUARTZ: a smoky-yellow to brown and black variety of the mineral quartz. It is often transparent and then yields gems of considerable beauty. Cairngorm is a yellowish variety. Morion is nearly black. Magnificent crystals weighing as much as 250 pounds have been found in Switzerland; very choice crystals, sometimes of large size, occur in Maine, North Carolina, Montana, and Colorado.

SMOLENSK, *smō-lĕnsk':* government of European Russia, bounded e. by the government of Moscow and Kaluga; 21,638 sq.m. Smolensk, watered by the Dnieper, Dvina, Gshat, Oka, Iput, etc., is one of the most fertile provinces of the empire, and produces great quantities of corn, hemp, and flax. Extensive forests yield splendid timber and mast. The rearing of swine is on a great scale. Manufacturing industry and export trade are largely expanding. Pop. (1897) 1,551,068.

SMOLENSK': fortified town of Russia, capital of the government of Smolensk; picturesquely situated on a range of steep declivities overlooking the river Dnieper, 250 m. w.s.w. of Moscow. It is one of the oldest towns in the empire, having been a place of note in the 9th century, is surrounded by massive walls (with 17 towers), and has three cathedrals, about 32 churches, and several monasteries, together with a diocesan seminary, a gymnasium, a military school for nobles, hospitals, etc. Smolensk has manufactures of linens, soap, leather, and carpets, and considerable export trade in corn and flax.—Smolensk is historically notable as the scene of a bloody repulse of the Russians under Barclay de Tolly and Prince Bagration, by Napoleon, 1812, Aug. 17, when on his march for Moscow.—Pop. 46,900.

SMOLLETT, *smŏl'ĕt,* TOBIAS GEORGE, M.D.: British

THE SMOKY MOUNTAINS.

novelist: 1721-1771, Oct. 21; b. Dalquhurn, of an old and distinguished family in Dumbartonshire. His grandfather, Sir James Smollett, of Bonhill, was one of the commissaries or consistorial judges of Edinburgh, and sat in the Scots parliament as representative of his native county. While he was very young his father died; leaving his family unprovided for; but young Smollett was well educated, and afterward apprenticed to a surgeon in Glasgow. He is said to have wished to enter the army, and, being disappointed, to have avenged himself on his grandfather, who thwarted his inclinations, by describing Sir James under the unamiable character of the old Judge in *Roderick Random*. This is related by Scott and all the biographers, but it must be a mistake; for Sir James, the grandfather, died 1731, when Tobias was only in his tenth year. The duty of attending to the education and settlement of the youth would naturally devolve on his widowed mother and on the Laird of Bonhill, his cousin. It is certain, however, that Smollett inherited no fortune; and in his 18th year, he went to London with a tragedy which he had written on the assassination of James I. of Scotland, and which he trusted would lead to distinction, if not wealth. He was grievously disappointed, and being reduced almost to starvation, was glad to accept the post of surgeon's-mate on board one of the ships in the unfortunate expedition to Carthagena, 1741. He soon quitted the service in disgust, though not before he had seen enough of naval life and character to be of inestimable value to him as a novelist; and returning to London, he entered on the profession of an author. He made, indeed, repeated attempts to obtain practice as a physician; and 1750, got a diploma of M.D. from Aberdeen (according to some authorities, from a German university, 1752), but his hasty irritable temper and independent spirit, joined to his natural propensity to satire, prevented his success. Even his literary career was a ceaseless warfare. In 1748, in his 27th year, he produced *Roderick Random*, which found a great popular welcome, and seemed at once to place its author very near, if not in the actual rank of, Fielding as a novelist. In 1751, appeared *Peregrine Pickle*, a more ambitious and not less successful work; and 1753, *Ferdinand Count Fathom*, inferior perhaps as a whole, though with a richer variety of amusing, queer, or disgusting folk, and containing scenes of striking adventure and eloquent description. Smollett next translated *Don Quixote* (1755); in which, it is admitted, he was surpassed by Motteux and Jarvis. He then undertook the editorship of a new tory and high-church journal, *The Critical Review*—the most unfortunate of all his engagements, as it involved him in endless quarrels and personalities: for one article, an attack on Admiral Knowles, he suffered three months' imprisonment, and was fined £100. In 1758 he published his *History of England*, 4 vols. quarto—a history from the descent of

Julius Cæsar to the treaty of Aix-la-Chapelle 1748. This work, begun and completed in 14 months, realized for him £2,000. Though superficial and inaccurate, it has passages of fine animated writing and masterly delineation of character. We next find Smollett in political controversy with Wilkes and others, and defending Lord Bute's administration; but he lacked tact and temper for such work and reaped no laurels as a politician. Another novel appeared 1760-1, *The Adventures of Sir Launcelot Greaves;* 2 vols. of querulous *Travels in France and Italy* (1766); *The Adventures of an Atom* (1769), a political satire, unworthy of its author; and (1771) only a few months before his death, *The Expedition of Humphrey Clinker,* the best of all his novels; and in the opinion of Thackeray, one of the very best in the whole range of imaginative literature. Worn out with literary cares, private misfortunes, anxiety, and ill-health, the novelist retired to Italy, and died at Monte Novo, Leghorn.

As a novelist, Smollett is distinguished by broad humor and burlesque, affluence of incidents and characters, and a singularly easy and picturesque style of narrative. He is often careless, but rarely dull. He does not indulge in digressions, like Fielding; and though less of a literary artist than his great English rival, his works are read with more intense interest: he had, in fact, greater imagination and poetical sensibility than Fielding; and his best qualities have had a wider influence on the English novel. He added largely to the stock of original characters and humorists—Strap, Tom Bowling, Morgan the Welshman, Lismahago, and Matthew Bramble are probably still unsurpassed. Delicacy of taste was neither possessed nor sought by either Fielding or Smollett; and the latter—as having the more exuberant fancy—may be deemed even the more gross and sensual of the two; he had to apologize for and withdraw some of the most offensive indecencies in his first ed. of *Peregrine Pickle.* Admiration for his abilities might be lost in abomination of his grossness, were not the general coarseness of his times remembered in mitigation.

SMOLT, n. *smōlt* [Scot. *smolt,* a smolt: AS. *smolt,* fat]: a young salmon that has acquired its silver scales, being a little more than a year old. See SALMON.

SMOOTH, a. *smôth* [AS. *smethe,* even, soft; the radical meaning is pliable: Ger. *schmieden,* to forge: Low Ger. *smödig;* Dut. *smijdig,* malleable: Dan. *smidig,* pliable]: having an even or level surface; not rough; sleek; glossy; not ruffled, as water; that flows without stops or difficulty, as words; bland; not harsh; insinuating: V. to make plain or even on the surface; to flatten; to make flowing; to soften; to ease; to render easy; to calm: N. a part free from roughness. SMOOTH'ING, imp. SMOOTHED, pp. *smóthd.* SMOOTH'LY, ad. *-lĭ,* without obstruction; easily; with soft and bland language; mildly. SMOOTH'-

NESS, n. *-nĕs,* the quality or condition of being smooth; freedom from roughness; easy flow of words; blandness in address. SMOOTH-BORE, n. a gun not rifled. SMOOTH-BORED, a. having a smooth surface inside of a gun, as opposed to rifled. SMOOTH-CHINNED, *-chĭnd,* having a smooth chin; beardless. SMOOTH-FACED, having a soft or mild look. SMOOTH-PACED, that moves with even paces. SMOOTH-TONGUED, flattering; plausible. SMOOTHING-IRON, a flat piece of iron having a polished face and a handle, which, when heated, is used for smoothing linen; a flat-iron. SMOOTHING-PLANE, a carpenter's tool.—SYN. of 'smooth, a.': plain; even; flat; level; sleek; glossy; polished; soft; mild; bland; soothing; flattering; deceptive; voluble; adulatory;—of 'smooth, v.': to level; palliate; lessen; soften; calm; mollify; ease; flatter.

SMORZATO, ad. *smŏrd-zâ'tō,* or SMORZAN'DO, ad. *-zăn-dō* [It., dying away]: in music, term denoting that the bow of a violin must be drawn its full length, but lightened gradually till the sound is nearly gone; in general, gradual diminution till the sound altogether dies away.

SMOTE, *smōt:* pt. of SMITE, which see.

SMOTHER, v. *smŭth'ėr* [AS. *smorian,* to smother: Low Ger. *smaddern,* to meddle with dirty things: Dut. *smodderen,* to dabble, to dirty; *smooren,* to smoke, to suffocate: Scot. *smoor,* to stifle: Gael. *smod,* dust, dirt]: to extinguish life by causing smoke or dust to enter the lungs, or by depriving the lungs of air; to extinguish fire by excluding air; to suffocate; to suppress; to choke; to be suffocated; to be suppressed or concealed: N. in *OE.,* that which suffocates; smoke; thick dust. SMOTH'ERING, imp.: ADJ. wanting vent; suffocating. SMOTH'ERED, pp. *-ėrd:* ADJ. stifled; suppressed. SMOTH'ERINGLY, ad. *-ėr-ĭng-lĭ.* SMOTH'ERY, a. *-ĭ,* tending to smother.

SMOULDER, v. *smōl'dėr* [Low Ger. *smölen,* to smoulder: Dut. *smeulen,* to burn slowly with a thick smoke: Ir. *smuid,* smoke: Dan. *smul,* dust]: to burn or smoke slowly without flame; to consume away without showing the fire. SMOUL'DERING, imp. *-ėr-ĭng:* ADJ. burning in a smothered manner without flame. SMOUL'DERED, pp. *-dėrd.* SMOUL'DRY, a. *-drĭ,* in *OE.,* same as SMOULDERING, burning and smoking without flame.

SMUDGE, v. *smŭj* [Dan. *smuds,* Gael. *smod,* dirt, filth; *smuid,* smoke (from SMUT, which see)]: to stain with dirt; to stain or blot; to rub writing when the ink is wet; to blacken with smoke; to confuse the colors in painting: N. a suffocating smoke; a blot; a smear. SMUDG'ING, imp. SMUDGED, pp. *smŭjd.* SMUDGE-COAL, an English miner's term for coal that has been partially converted into a sort of natural coke or impure anthracite—known as *blind-coal.*

SMUG, a. *smŭg* [Ger. *schmuck,* pretty, handsome: Dan. *smuk,* pretty: Low Ger. *smul,* neat, trim]: spruce; neat;

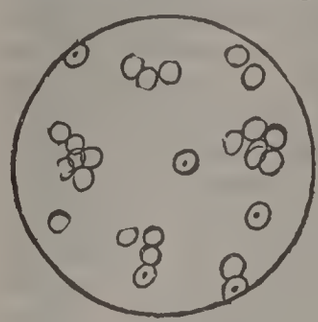
nice; dressed; pert; with affected niceness, but without good taste: V. to adorn; to dress up. SMUG'GLING, imp. SMUGGED, pp. *smŭgd.* SMUG'NESS, n. *-nĕs,* the state of being spruce; affected niceness in dress. SMUG-FACED, prim-faced.

SMUGGLE, v. *smŭg'gl* [Dan. *smugle;* Ger. *schmuggeln;* Dut. *smokkelen,* to smuggle: AS. *smugan,* to creep: Icel. *smeygja,* to slip into]: to bring goods into, or carry goods out of, a country secretly in order to escape payment of the legal duties; to convey clandestinely. SMUG'GLING, imp. *-glĭng:* N. the offense of passing goods into or out of a country without paying the legal duties; the act or practice of (see below). SMUG'GLED, pp. and a. *-gld.* SMUG'GLER, n. *-glĕr,* one who smuggles; a ship employed in smuggling.

SMUG'GLING: importing, or (in countries that levy export duties) exporting, goods prohibited, or without paying the duties imposed on goods not prohibited. The offense in general leads to forfeiture of the goods. In the United States, if goods are imported to defraud the revenue, the goods are forfeited, and the guilty party is liable to a fine of $50 to $5,000, or imprisonment not exceeding 2 years, or both. Penalties are prescribed also for officers of vessels who connive at S., or who resist the revenue officers. The revenue officers have power to search the persons as well as the baggage of travellers entering the United States from foreign countries. The dist. atty. prosecutes in the U. S. dist. or circuit court, persons alleged guilty of violating the revenue laws by S. After condemnation and sale of the smuggled goods, the proceeds, less costs and expenses, are distributed, part going to the informer (if he is not in the revenue service), part to the custom-house officers of the port, and part to the public treasury. The court may, on probable cause alleged, grant to a customs officer an order requiring an importing merchant, or other importer of dutiable goods, to exhibit his books or bills of lading.—See U. S. Revised Statutes, XXXIV. 10.

SMUT, n. *smŭt* [Low Ger. *smudden*, to dirty: Dan. *smuds;* Sw. *smuts;* Ger. *schmutz*, dirt, mud: Dut. *smotsen*, to stain; *smoddig*, smutty]: a spot or stain made with soot or other dirty substance; the dirty or foul matter itself; obscenity: fungoid disease in grain by which the grain is converted into a soot-like powder (see below): V. to foul; to stain; to tarnish or blacken; to be attacked with the disease of smut, as grain. SMUT'TING, imp. SMUT'TED, pp. SMUT'TY, a. *-tĭ*, soiled with soot or the like; full of smut; dirty; obscene. SMUT'TILY, ad. *-tĭ-lĭ*. SMUT'TINESS, n. *-nĕs*, the quality or condition of being smutty. SMUTCH, n. *smŭch*, a foul stain; a dirty mark: V. to blacken; to mark with soot or coal. SMUTCH'ING, imp. SMUTCHED, pp. *smŭcht*.

SMUT: popular name of certain small fungi of section *Coniomycetes*, and group or family *Uredineæ*, parasitical on plants, particularly on grasses, and notable for the abundance of dark-colored spores which they throw off. The name S., though somewhat variously used, is now generally limited to the genus *Ustilago*, in which the character above mentioned of the profusion of dark-colored spores is very remarkable. A remarkable kind of S. infests maize, swelling the ears to enormous size, sometimes even 12 inches in length. On cereals, the fungi usually attack the floral portion, but appear sometimes on other parts of the plant. They change the nutritive matter of the grain or plant into a black, and in some cases poisonous substance. As the disease does not spread from one plant to another, but is propagated by spores which become active when the seed germinates, and which develop within the substance of the plant, it cannot, after it has once appeared, be eradicated without sacrificing the plant itself. Preventive measures are the selection of the heaviest and best grain for seed; washing the seed in a strong solution of blue vitriol, using one pound of vitriol for each gallon of water, or in water heated to a temperature of 135°; the use of salt as a fertilizer; careful covering of the seed; and, as far as possible, the selection of fields which are free from taint of the disease. Treatment of the seed often fails to prevent S., because it has no effect on spores already in the soil. The *Ustilago segetum*, or dust-brand, attacks wheat and oats, and converts the heads into masses of black dust (see ERGOT). *Tilletia tritica*, affecting wheat and often very destructive, changes the interior of the kernel into a black powder with extremely offensive odor, but gives no external sign of its presence. This form of S. is known in England as the Wheat-bunt. *Ustilago maydis* is the S. of Indian corn (see INDIAN CORN); *Urocystis occulta* attacks rye, and *Urocystis cepulæ* sometimes injures the onion.



Spores of Smut.

The reeds of the fenny districts of England are often much affected by a species (*Ustilago typhoides*), which much impairs their quality for all purposes, and has the more remarkable property of greatly affecting the health of the laborers employed in cutting and sorting them, producing not only a sense of oppression, but swelling of the head, formation of vesicles, and inflammation of the bowels, besides other symptoms, such as are often produced by cantharides.

SMYRNA, *smér'na:* one of the most ancient and important cities of Asia Minor, and the only one of the Greek cities on the w. coast which has retained its name and importance to the present day. The early history of S. is very obscure; varying accounts represent it either as originally an Ionian colony, or as having been at first an Æolian city, which, by treachery, fell into the hands of

Colophonian (Ionian) exiles, and subsequently, about B.C. 700, formed part of the great Ionian League. This earliest city of S., known among the Greeks as 'Old Smyrna,' was on the banks of the little river Meles, on the n.e. side of the Hermæan Gulf, now the Gulf of S. (q.v.), and, being one of the cities that claimed the honor of being the birthplace of Homer, here, near the source of the river, a grotto was shown, in which he was said to have composed his poems. This old city of S. was destroyed, we are told, by the Lydian king Alyattes, and the place remained deserted and in ruins till after the Macedonian conquest, when the city was rebuilt between two and three m. s. of its original site. This city of 'New S.' was founded by Antigonus, and enlarged and embellished by Lysimachus; it was laid out with great magnificence, and adorned with several fine buildings, among which was the *Homereum*, where the poet was worshipped as a hero. The city had an excellent harbor; and from its admirable situation, soon became one of the finest and most flourishing in the ancient world. In the early history of Christianity, S. holds a distinguished place as one of the Seven Churches addressed in the Apocalypse, and as the scene of the labors and martyrdom of its first bishop, Polycarp. After various vicissitudes during the middle ages, it fell finally into the hands of the Turks, in whose possession it has since remained—the most flourishing city of the Levant.

The modern city of S. (Turkish *Izmîr*) occupies the site of New S., being built partly on the plain at the head of the gulf, partly on the declivity of a hill, the ancient Mons Pagus; and, from the sea, has an attractive appearance. There are some good quays, and some handsome buildings of stone; but the greater part consists of low wooden houses, mostly one story high; and the streets, with few exceptions, are ill-paved, narrow, crooked, and dirty. The city, however, in these respects is better than most other Turkish towns, and improvements have of late years been made. As usual in Turkish towns, each element of the mixed pop. has its separate quarter. S. contains several Greek, Armenian, Rom. Cath., and Prot. churches, and about 20 mosques. There are six journals published in five different languages. The harbor is excellent; ships of large burden anchor close to the quays; and the trade is very important and extensive. A railway, 81 m. long, constructed mainly with English capital and by English engineers, connects S. with Aidin, an important inland commercial town. Another railway, 61 m. inland (to Cassaba), extends to Philadelphia (Alasher). The chief imports are woolen, cotton, and silk fabrics, iron, tin, lead, copper, steel, zinc, glass, and hardware goods, coffee (6,000,000 lbs. annually), sugar, spirits, spices, indigo, cochineal, etc. Exports are wool, cotton, silk, carpets, hides, opium, madder, copper, valonia, olive-oil, drugs, and gums, figs, raisins, and many other articles. More than 2,500 vessels (of about 1,500,000 tons) annually enter and clear the port. The annual value of imports averages about $15,000,000, and of exports about $20,000,000.

S. is regularly visited by the ships of the French, Austrian, and Russian Steam-navigation companies, and by traders from many countries. It suffered severely from fire in the summers of 1841 and 45, and has been often ravaged by earthquakes and the plague. The city and its territory are governed by a pasha. Of the ancient cities not much remains. Some slight ruins mark the site of Old S. Of New S., some remnants of the massive walls on the hill s.e. of the city are still seen; there are fragments of the ancient theatre; and columns belonging to a temple. Pop. (about) 210,000.

SMYR'NA, GULF OF: inlet of the Ægean Sea, on the w. coast of Asiatic Turkey, named from the city of Smyrna (q.v.), at its head. It is 40 m. long, about 20 m. in greatest breadth, and contains several islands. Its waters are deep, and it affords good anchorage.

SMYTH, *smith*, CHARLES PIAZZI, LL.D.: astronomer: b. Naples, 1819; d. 1900, Feb. 21. He was educated in England; began his astronomical service at the Royal Observatory, Cape of Good Hope, 1835; and was first astronomer royal for Scotland at the Royal Observatory, Edinburgh, 1845-88. He assisted in remeasuring La Caille's s. African arc of the meridian; established a daily time-ball and an electrically fired daily time-gun in Edinburgh; visited and reported on Russian observatories 1859; visited and published minute investigations and curious theories on the great pyramid in Egypt 1864-5; and compiled a star-catalogue and ephemeris (pub. 1877-86). He wrote *Our Inheritance in the Great Pyramid* (1864); *Life and Work at the Great Pyramid* (1867); *Antiquity of Intellectual Man* (1868).

SMYTH, EGBERT COFFIN, D.D.: b. Brunswick, Me., 1829, Aug. 24; d. Andover, Mass., 1904, April 12. He graduated at Bowdoin Coll. 1848, and Bangor Theol. Seminary 1853: was prof. of rhet. at Bowdoin 1854-56, and of nat. and revealed religion 1856-63. In 1863 he became prof. of eccles. hist. in Andover Theol. Seminary, and, 15 years later, pres. of the faculty. His name was prominently connected with what is known as the new theology and the Andover case. On complaint to the Board of Visitors of the seminary (whose office, originally intended as an additional safeguard to the orthodoxy of the institution, was in dispute, as only or as more than appellate), a preliminary hearing, 1886, Oct. 25, was had before this board, on 16 counts, against doctrines inculcated by five professors. The complaint, amended to be more specific and against each prof. separately, was taken up, with answers filed, Dec. 28; and the board found that Prof. S. taught beliefs inconsistent with the creed of the seminary, in regard to the infallibility of the Bible, the power to repent without knowledge of Christ,

ane. a probation after death for those who have not known of and decisively rejected Christ in this life. The matter went to the Mass. supreme court, on appeal in respect to points of law—the trustees of the seminary sustaining Prof. S. The supreme court decided that the action of the visitors was void through a technical defect in their early proceedings: the result being that Prof. S. retained his chair. He edited the *Andover Review* from its establishment 1884, published sermons, and a lecture on the *Value of the Study of Church History in Ministerial Education* (1874); and was co-translator of Uhlhorn's *Conflict of Christianity with Heathenism* (1879)

SMYTH, SAMUEL PHILLIPS NEWMAN, D.D.: Congl. minister, and author: b. Brunswick, Me., 1843, June 25: bro. of Dr. Egbert C. S. He graduated at Bowdoin 1863; taught in the naval acad. at Newport, R. I.; was officer in a Me. regt. of vols. in the civil war; after which he graduated at Andover Theol. Seminary. His pastorates have been Congl. at Providence, R. I.: Congl. at Bangor 1870–75; 1st Presb. Chh., Quincy, Ill., 1876–82: and, since then, the First Chh. (Congl.), New Haven, Conn. He is regarded as one of the exponents of the 'new theology,' and has published *The Religious Feeling* (1877); *Old Faiths in New Light* (1879); *The Orthodox Theology of To-day* (1881); *The Reality of Faith* (1884); *Personal Creeds* (1890).

SNACK, n. *snăk* [Low Ger. *snapps;* Ger. *schnapps,* interjections expressing 'quickness': Sw. *snabb,* quick: Scot. *snak,* a snap of the jaws]: a share; a slight hasty meal. TO GO SNACKS, to go shares; to share and share alike.

SNAFFLE, n. *snăf'fl* [Dut. *snavel,* a horse's muzzle: Low Ger. *snavel;* Ger. *schnabel;* O. Dut. *snabbe,* a snout or beak]: a bridle crossing the nose, and having a slender mouth-bit without branches: V. to manage with a snaffle; to bridle. SNAF'FLING, imp. *-flĭng.* SNAF'FLED, pp. *-fld.*

SNAG, n. *snăg* [Gael. *snaigh,* to cut, to carve: Scot. *sneg,* to cut with the sudden blow of a sharp instr.: Icel. *snagi,* a clothes-peg]: a short rough branch; a knot; a sharp protuberance; a tooth projecting beyond the rest; a sunken tree, of which one end appears at or near the surface in a river, while the other is firmly fixed at the bottom: V. to hew roughly, as with an axe; to disable or pierce by means of the trunk of a tree floating end upward in a river, as to *snag* a boat. SNAG'GING, imp. SNAGGED, pp. *snăgd:* ADJ. full of snags; full of sharp protuberances. SNAGGY, a. *snăg'gĭ,* abounding with snags; full of short rough branches or sharp points; knotty.

SNAIL, n. *snāl* [AS. *snægl;* Ger. *schnecke;* Dan. *snegl;* Icel. *snigill,* a snail: Swiss, *schnaken;* AS. *snican,* to creep]: small, slimy, slow-creeping creature, some species of which have shells: a drone; a slow-moving person. SNAIL-LIKE, a. resembling a snail; slow-moving. SNAIL-CLOVER, plant, so called from its pods resembling the shells of snails; called also *snail-trefoil,* the *Medĭcāgo scutellāta,* ord. *Leguminōsæ.* SNAIL-SHELL, shell that

covers a snail.—The *Snail* (*Helix*) is the common name for gasteropodous mollusks of family *Helicidæ*, having generally a sub-globose, sometimes a depressed, spiral shell; the mouth of the shell more or less encroached upon by the last whorl but one, strengthened with an internal thickened rib, its edges more or less reflexed; the *foot* of the animal long, and pointed behind; the tentacles four, the lower pair much smaller than the upper; the tongue armed with many—often 100 to 200—longitudinal rows of teeth. The species are very numerous, more than 1,400 having been described; besides many fossil species. Some of the groups have been constituted into separate genera by recent authors, but all retain the popular name S., which is indeed often extended to all the *Helicidæ*. As an instance of the general distribution of snails, *Helix aspersa*, one of the common garden-snails of Britain, is found generally throughout Europe, great part of Asia and n. of Africa, and in S. America.—Snails feed chiefly on vegetable substances, though they are indiscriminate in their appetite, and even devour the dead of their own kind. The mischief which they do to garden-crops is well known; and gardeners lay down cabbage-leaves and the like to attract them, in order that they may be destroyed; any greasy substance increasing the attractiveness of the bait.—Snails delight in warm moist weather; in dry weather, their chief time of activity is at night, and they hide themselves by day; but after rain, they come forth at

Common Snail and Eggs (*Helix aspersa*):
1, Eggs; 2, Appearance when newly hatched; 3, Slightly advanced stage; 4, Mature Snail.—Copied from Morton's *Cyclopædia of Agriculture*.

any hour in quest of food. At the approach of winter, or in very dry weather, they close the mouth of the shell with a membrane (*epiphragm*), formed by the drying of the mucous substance which they secrete, and become inactive and torpid. Some, as the Edible S. (*H. pomatia*), make a succession of such membranes; the outer one of which is also strengthened by a quantity of calcareous matter, the secretion being at first a white viscid fluid, but quickly hardening like plaster of Paris. When this is to be removed, a fresh secretion of fluid mucus softens it at the edges. Snails retreat into crevices for the winter, or

into holes which they make in the earth, and which are roofed over with earth, dead leaves, etc., agglutinated by secreted mucus.—Snails are hermaphrodite, but mutual impregnation takes place, and when they are about to copulate, they excite each other by pricking or even piercing with a sharp calcareous glass-like style, affixed to a peculiar muscular sac which serves for its protrusion, and which is produced by recent secretion, not being found in them on dissection, except at the season of reproduction. Extraordinary as this fact is, it has been the subject of much exaggeration; and in works on natural history not of very old date, we read of snails throwing darts (*spicula amoris*) at each other, all which appears fabulous, though it is probable that the calcareous style may be often broken off in its use. The eggs of snails are round, and enveloped in a skin; they are deposited generally in little clusters. The eggs of the common garden-snails of Britain are about the size of peas, and deposited just under the surface of the soil.—Snails possess in very high degree the power of repairing injuries, not only of the shell—though the removal of the whole shell is fatal to them—but also of the soft parts. When the tentacles are cut off, they grow again; and even if the head is cut off, a new head is produced.—The EDIBLE S. (*H. pomatia*) of s. Europe is found in the chalk and oolite districts of s. England, where it is said to have been introduced from the continent in the 17th c.; but this is doubtful. It has a shell about two inches in diameter and two inches in height, whitish or pale tawny, with four darker bands, often not very distinct. It was esteemed as food by the ancient Romans, who fattened their snails in inclosures (*cochlearia*) made for the purpose, feeding them delicately on meal and boiled wine. It is still in esteem for the table in various parts of Europe, and is occasionally used in England. Nor is it the only species so used; the common garden-snails are probably equally good, though not so large, and 'the glassmen at Newcastle once a year have a snail-feast; they generally collect the snails themselves in the fields and hedges the Sunday before the feast day.'—Turton's *British Land and Fresh-water Shells*. Snails of different species are also an article of export on a small scale from England to the United States, packed in old casks, in which they are conveyed very well, fixing themselves one upon another to the cask, and leaving a vacant space in the centre. Snails boiled in milk are popularly regarded as a remedy for diseases of the chest, and for this purpose they are brought to Covent Garden market, London. If any benefit results from the use of them, it is probably due to their nutritious qualities.—Some of the tropical species of Helix are very large, and some have very beautiful shells.—For the many United States species, of which interesting collections may be formed, especially in limestone regions, see W. G. Binney's works, pub. by the Smithsonian Institution. The shells are prepared by scalding, and drawing forth the dead animal by help of a bent pin.

SNAKE, n. *snāk* [AS. *snaca;* Icel. *snakr;* Dan. *snog;* Sw. *snok;* Skr. *naga,* a snake: Gael. *snàig,* to crawl, to creep: AS. *sníican,* to creep]: creeping reptile (see below): V. among *seamen,* to wind a small rope round a large one in the spaces betwixt the strands. SNA'KING, imp. SNAKED, pp. *snākt.* SNAKY, a. *snā'kĭ,* resembling a snake, or pertaining to one; winding; sly; insinuating; deceitful. SNA'KISH, a. *-kĭsh,* having the qualities of a snake. SNAKE-BIRD (see DARTER). SNAKE-BITES (see VENOMOUS BITES AND STINGS). SNAKE'S-HEAD, *formerly,* in *Amer.,* a piece of strap iron, used on the earliest railways, which being sometimes curled up on one end was liable to be caught over a wheel and to wreck the car: bars have long since taken the place of thin straps. SNAKE-ROOT, familiar name of several plants; the root of the *Polyg'ăla senĕga,* or senega-root, ord. *Polygalăcĕæ,* so named from the supposition that it is an antidote to the bite of the rattlesnake (see POLYGALA; ARISTOLOCHIA). SNAKE-STONE, a familiar name for the fossils called ammonites; a mottled or spotted whetstone found in Scotland, and also called Ayrstone, as found chiefly on the banks of the river Ayr. SNAKE-WEED, the plant Bistort (q.v.), named from the double twist of its root. SNAKE-WOOD, wood of red hazel color, with numerous black spots and marks, very beautiful, and scarce (see LETTER-WOOD); a wood, supposed remedy for the bite of certain snakes. SNAKE IN THE GRASS, a secret enemy.

SNAKE: term synonymous with serpent. While snakes are found in almost every part of the globe, certain regions show them in greater variety and number than others. No snakes are found on the western hemisphere n. of the 60th degree. On the eastern hemisphere they have disappeared under the 65th degree, and none of them occur in Ireland and the Canary Islands. The northern Old World range, in which are included Africa n. of the Atlas mountains, Europe, Asia Minor, Persia, North and Middle Asia to the Himalaya, China, Japan, and the Aleutian Islands, possesses the least number and most of these are colubrid snakes and a few of the Viperidæ. The Ethiopian range, comprising the whole of Africa, s. of the Atlas, and Madagascar are rich in Colubridæ and Pythonidæ. The venomous snakes are represented by Proteroglyphs and Viperidæ, some of the latter reaching an enormous size.

The real home of the snakes is to be found in the Indian range, which includes the whole of southern Asia, Burmah, Malacca, Southern China, the Malay Archipelago, the Sunda Islands and Philippines. In this range also is the real home of the Sea snakes. The venomous snakes are represented in enormous numbers compared to the non-venomous, the ratio being about one to six of the latter. The Australian range, consisting of the Australian continent, Tasmania, the Papuan, and other islands of the southern Pacific Ocean, is not poor in

snakes and two-thirds of all known are venomous. The northern New World range possesses quite a number of species, chiefly Colubridæ, but no true vipers. The venomous snakes with the exception of a few Elapidæ are Bothrophora or Pit-vipers. Next to the Indian range in richness of Ophidian variety and number, is the southern New World range, which comprises Southern Mexico, Central and South America, the Galapagos and Falkland Islands. The types are very much the same as in the northern range, the Colubridæ and Boidæ, however, outnumber the venomous Bothrophora and Elapidæ. The Opisthoglyphs are well represented in South America. Certain parts of the world are usually associated in our minds with some one or more especially conspicuous or dreaded reptiles of this order. So, for instance, is the Bungar or Pama, *Bungarus fasciatus,* or the Daboya, *Vipera Russelii,* and the Cobra de Capello, *Naja tripudians,* of India, scarcely out of our mental association when considering that part of the world. In the same manner we associate the largest known venomous snake, the *Ophiophagus elaps,* with the Indian Archipelago. This formidable reptile attains a length of over 12 ft., and one is authoritatively reported of having been over 14 ft. in length. New Holland possesses its dreaded *Pseudechis porphyrous,* the Australian continent has its Yellow Adder, *Alecto curta.* The tragic end of Cleopatra never fails to remind us of the deadly Asp, the *Najo hajo,* of North Africa. From the 17th degree n., nearly the whole of Africa is the home of the fearful Puff Adder, *Clotho arietans.* Some of the West Indian Islands, and especially Martinique and Guadeloupe, are the home of the terrible Fer-de-Lance, *Bothrops lanceolatas,* which, while a dangerous companion of man, is at the same time one of his most beneficial helpmates in the cane and rice fields of those islands on account of the relentless and effective war which it wages upon the enormous number of rats infesting the country. On the Central and South American continents the Tamigough, *Lachesis muta,* and *Bothrops atrox* are the most dreaded venomous snakes.

The principal genera and species of non-venomous snakes of North America east of the Rocky mountains are the Ribbon or Garter Snakes, *Thamnophis,* of which some twenty-five species are described. The most common of these are *T. saurita,* clear brown below the lateral stripe, found e. of the Alleghanies; *T. proxima,* olivaceous on the sides, commonest Garter Snake in the southern states e. of the Mississippi; *T. sirtalis,* the striped Garter Snake, probably one of the largest species of the genus and rather more common in the eastern states than south. The Pine or Bull Snakes, *Pituophis,* are all large reptiles of which about five species are described from nearly every part of North America, with the exception of some of the Gulf states. The latter region, however, is rich in Water Snakes, *Natrix,* of which about twenty

species are known. *N. fasciata* and *N. rhombifer* are probably the largest representatives of the genus. The Black Snakes, *Bascanion*, have two widely known and distributed species, *B. constrictor*, the Black Snake, or Black Chaser, and *B. flagelliforme*, the Coach-whip Snake, so called on account of its long and slender tail. The genus Coluber, generally distributed over North America, has quite a number of well-known species and most all of its members are conspicuous for the remarkably intelligent expression of their large and lustrous eyes. They are known under the popular name of racers; the Fox Snake, *Coluber vulpinus*, the four-lined Chicken Snake and the Mountain Black Snake are probably the most common. The Milk Snakes, *Ophibolus*, constitute another widely known genus, some species of which are very handsomely and conspicuously colored and marked. *O. getulus sayi* is the King Snake of the southern states principally. Its popular reputation for destroying, especially venomous snakes, has been experimentally proven to be a myth as it is not immune to the venom, but, on the contrary, succumbs very quickly to its effects. *O. getulus getulus* is the exceedingly handsome Chain Snake, black with forked confluent yellowish-white lines forming a dorsal chain. It is fairly common from Maryland to Florida. *O. doliatus doliatus* is another quite common and gaily colored snake of about 20 in. in length. It is bright red in color, ringed with black-bordered yellowish-white bands. A similarly colored snake is *Cemophora coccinea*, the Crimson Snake, which is common in the southern states. *Osceola elapsoidea*, the Scarlet Snake, from Virginia to Florida, length about 20 in. In the three colors, red, yellow or yellowish-white and black, the last three species resemble the venomous proteroglyph, *Elaps fulvius*, which consequently is often confounded with them. The difference, however, is readily seen, the predominating color in Ophibolus, Cemophora and Osceola is red, in Elaps black. The red-bellied Horn Snake, *Farancia abacura*, is a much dreaded but perfectly harmless snake of the southern states; it attains a length of 5 ft, blue-back with bright red side spots; it is erroneously believed to be furnished with a sting at the end of the tail. Another equally harmless and also equally dreaded reptile is the Hoop or Red-lined Snake, *Abastor erythrogrammus*, which occurs chiefly on the Atlantic coast, from North Carolina to Florida. It is blue-black, with three longitudinal lines, the dorsal one of which is bright red, the lateral ones orange. Of the popularly believed highly dangerous snakes of our country none are more conspicuous than the harmless members of the genus Heterdon or Hog-nosed Snake of the eastern United States; they attain a length of about 30 in., the rostral shield is sharply keeled and recurved; when frightened the animal flattens its head and neck and expelling violently the air contained in the lungs, produces

a loud blowing noise, hence the name 'Blowing Viper.' Two distinct species with a number of sub-species and varieties are described; they are perfectly harmless and cannot be induced to bite even under the strongest provocation. There are quite a large number of other genera of harmless snakes of North America which might be mentioned but such enumeration does not fall within the scope of this article.

With the exception of suspects such as Tantilla, Coniophanes, Leptodeira and Trimorphodon, only three genera of venomous snakes are found in the United States. One is the already mentioned proteroglyph, Elaps, with probably two or three species, the best known and widest distributed of which is *E. fulvius* or Harlequin Snake. It is brightly colored and the arrangement of the colors is somewhat similar to that of the already mentioned harmless genera, Ophibolus, Cemophora and Osceola. There is, however, something about Elaps which would cause even the uninitiated but unprejudiced observer to discriminate between it and the harmless genera. The color scheme of Elaps carries with itself a forbidding influence. The ground color may be considered blue-black, though the red rings occupy nearly as much space, so as to convey the appearance of a succession of alternating black and red rings. The red rings are bordered with yellow; the anterior part of the head, including the tip of the lower jaw, is black; the tail is alternately black and yellow. It is a gentle and not at all aggressive creature and may even be handled with impunity; it is a native of the southern states from North Carolina and Virginia to Texas. The second genus, Agkistrodon, is representative of the Solenoglypha, with only two species, the Copperhead, *A. contortrix,* and the Water Moccasin, *A. piscivorus.* The Copperhead attains a length of 40 in. and occurs in most of the eastern and southern states; it has a grayish-brown ground color with a series of dark brown Y-shaped blotches along the vertebral line; the top of the head is usually bright reddish brown, hence the popular name. The Water Moccasin attains a length of 4 ft. and over; greenish to chestnut brown with darker markings; head above, purplish black. It is essentially a swamp snake and has about the same range as the Harlequin Snake. Of the Crotalidæ, the genera Crotalus and Sistrurus are represented; the former contains about ten species, of which the Diamond Rattler is by far the largest and most powerful; this reptile attains a length of 7 ft. and is found chiefly in Florida and from there on westward in all Gulf states as far as the Mississippi river, but does not occur on the w. bank of that river. In Texas it is replaced by the smaller Texas Rattler, *C. atrox,* and the Prairie Rattler, *C. confluentus.* The Ground Rattlesnakes, *Sistrurus,* are represented in the United States by only two species, the Massasauga, *S. catenatus,* and the Common Ground

Rattler, *S. miliarius*, which never attain a greater length than 3 ft. for the former and even less than that for the latter.

SNAKE, or LEWIS (the SHOSHONE of the Indians): a river which has its rise in the mountains of western Wyoming, in two streams, called the North and South Forks. Entering Idaho the river flows s.w., then n.w. to the Oregon state boundary, then n., forming the boundary for 100 m., between Oregon and Idaho to Lewiston, and the boundary between Washington and Idaho for 30 m. It then turns westward, crosses the southeastern part of Washington, and enters Columbia river near lat. 46° 12′ n. and lon. 119° w. Its length is estimated to be about 1,000 m. Where the North and South Forks unite the elevation is 4,800 ft., and at the mouth, where it enters the Columbia, it is 340 ft. Its course is through a mountainous country, here and there entering plains, winding around seemingly extinct volcanoes, passing through fertile lands in Washington. It is noted for its wonderful cañons, and in places for the springs that pour in great abundance from its northern wall.

SNAKE DANCE: a dance of religious character performed by the Moqui Indians, living in Arizona, United States of America. The dance is known to have been performed by this tribe of Indians, in the same manner and in the same place, ever since the middle of the 16th century, when the Spanish explorers entered this part of America. The rite is particularly revolting in some of its details, which include the bearing of live serpents in the hands and mouths of the dancers. As many as 100 snakes are used in a dance and each of these is borne by the dancers while dancing, either in his hands or mouth, is then deposited upon the ground, where it is sprinkled with the sacred cornmeal by the Indian squaws, is picked up, held by old men, then by little boys, infants even, and is then deposited in a sacred tent lined with buffalo skin, inside of which a sacred tree is growing. Toward the end of the dance the snakes are taken out of the tent, and carried in armfuls by the Indian men, are placed on the ground within a circle of sacred meal in front of a sacred rock. Here, to the accompaniment of prayers and chants, the serpents are sprinkled with the sacred cornmeal until the whole writhing, wriggling mass is completely covered by the meal. The dance concludes by the Indian men grasping each as many snakes as he can hold and dashing down a steep precipice at top speed. At its foot the snakes are liberated, scattered in every direction. The ceremony is discribed as most revolting. For a full account consult John G. Bourke's *Snake-Dance of the Moquis* (1884).

SNAKE-EEL: an eel of the large family *Ophichthidæ*, scaleless, and with the extremity of the tail free, that is, not surrounded by a fin. These eels are found abun-

dantly in tropical seas about rocks and coral reefs, and are often gayly colored like murænas, to which they are allied. Consult Jordan and Evermann, *Fishes of North and Middle America* (1896).

SNAKE-STONE: small rounded piece of stone or other substance, reputed to be efficacious in curing snake-bites. A belief in their efficacy has been long and very widely diffused. Small perforated balls and rings of various kinds of stone, ivory, etc., strung together like beads, were formerly used as snake-stones in Scotland, being given to cattle to chew when they were bitten by vipers. Of course, they could be expected to act only as a kind of charm. Many of the snake-stones used in India and the further east seem of no greater value. Some, however, appear to be really efficacious, being applied to the wound and absorbing blood from it with the poison before it has entered the system: remarkable instances are related of speedy cures thus effected. The snake-stone adheres for a short time to the wound, and then falls off. The wounded limb is meanwhile rubbed downward. Two small snake-stones, each the size of a large pea, brought from India, and believed to have cured a man bitten by a cobra, were found by Mr. Quekett to be composed of some vegetable matter. Sir James Emerson Tennent brought from Ceylon three snake-stones that had long been employed for the cure of snake-bites. On being analyzed by Faraday, one proved to be a piece of animal charcoal or charred bone; another was chalk; the third was of vegetable matter, and resembled a Bezoar-stone (compare MAD-STONE).

SNAP, v. *snăp* [Dut. *snappen;* Ger. *schnappen,* to snap: Sw. *snabb,* quick (see also SNACK)]: to catch at suddenly, as with the teeth; to break short or at once; to try to seize; to break without bending; to utter sharp words: N. a sudden eager bite; a breaking short without bending; a sharp noise, as from the sudden breaking of a body; a catch or small lock, closed and opened by pressure; a small, circular, thin, and crisp cake of ginger-bread to form one bite or mouthful. SNAP'PING, imp. SNAPPED, pp. *snăpt.* SNAP'PER, n. *-pĕr,* one who or that which snaps. SNAP'PISH, a. *-pĭsh,* eager to bite; peevish; apt to speak tartly or in anger; crabbed. SNAP'PISHLY, ad. *-lĭ.* SNAP'PISHNESS, n. *-nĕs,* the quality of being snappish; tartness. SNAPPY, a. *snăp'pĭ,* tart and ill-natured; peevish. SNAP-DRAGON, plant of several species having showy flowers, somewhat resembling the faces of animals; a Christmas game, the chief feature in which is snatching raisins from burning brandy. SNAP-LOCK, a lock shutting with a catch or snap. TO SNAP AT, to attempt to bite, as a dog; to snarl at; to snub. TO SNAP OFF, to break suddenly; to bite off suddenly. TO SNAP ONE UP, to treat with sharp words suddenly. TO SNAP UP, to snatch greedily; to gobble up.

SNAPDRAGON, *snăp'drăg-on* (*Antirrhinum*): genus of plants of nat. order *Scrophulariaceæ*, consisting of annual and perennial herbaceous plants, natives chiefly of temperate parts of the n. hemisphere. They have the calyx 5-parted; the corolla swollen at the base, but without a spur, and *personate* (Lat. *persona*, a mask), i.e., its mouth closed by pressure of the lower against the upper lip; and the fruit is a 2-cell oblique capsule, opening by three pores at the apex. The English name refers to a peculiarity of the corolla, whose lower lip if forcibly parted from the upper, so as to open the mouth, shuts with an elastic spring or snap. Some of the species have very little flowers. *A. majus* in many fine varieties has long been a favorite in gardens.

SNAPHANCE, *snăp'hăns* [Dut. *snap*, snap; *haan*, cock]: spring-lock of a musket or pistol; hence the name of a form of musket used in the 17th and first half of the 18th century, called also Asnaphan. See LOCK.

SNAPPERS: a rather numerous assemblage of fishes belonging to the genus *Lutjanus* and related genera, usually considered as belonging to the family *Sparidæ*, but sometimes erected into a distinct family, *Lutjanidæ*. They have the body more elongated than the typical members of the *Sparidæ*, the teeth little differentiated and never incisor-like, though some are usually enlarged and caniniform and there are always teeth on the vomer. The dorsal fin is continuous, with strong spines, and the anal fin has three stout spines. The species of *Lutjanus* inhabit most warm seas and about 20 are found in our southern waters, some of them attaining importance as food fishes. The red snapper, *Lutjanus aya*, is a handsome rose-red fish, the young with a black blotch on the side. It attains a length of 2½ ft. and a weight of 25 pounds, and is economically the most important of the group. Throughout the West Indian region and in the southern United States it is a great favorite, and is shipped to northern markets also in considerable numbers. The centre of the fishery is Pensacola, from which smacks visit the snapper banks in various parts of the Gulf of Mexico. The gray or mangrove snapper, *L. griseus*, is another abundant and widely distributed species throughout the same region and sometimes strays northward as far as Cape Cod. It is of a dark green color above and reddish below and is further distinguished from the red snapper by the much lower ventral fin. Being smaller than the latter it is of less commercial importance, but because of its greater abundance in shallow waters is an even greater favorite with amateur anglers. A third species is the mutton fish, *L. analis*. This is a beautiful fish in life, being olive green above, with red fins and pale blue spots and streaks on the head and sides. It equals the red snapper in size and, like the other species, frequents rocky banks and spawns in summer. It is said to be the most important food fish

in Havana. All of the snappers are gamy and are caught chiefly on hand lines, but in Jamaica and other West Indian islands in cane fish-pots constructed on the principle of lobster-pots.

SNAPPING TURTLE: a large fresh-water turtle, *Chelydra serpentina,* widely distributed over the United States. These voracious creatures grow to a considerable size, a weight of 20 pounds being far from uncommon, and are prized as food. Their popular name is derived from their ferocity in captivity, and their habit of biting or snapping at everything that comes in their way. Called also alligator terrapin and alligator tortoise.

SNAR, v. *snâr:* OE. for SNARL.

SNARE, n. *snär* [Dut. *snaar;* Icel. *snara;* Dan. *snare,* a cord: Fris. *snar,* a noose: Ger. *schnur;* Sw. *snöre,* a string]: a line or string with a running noose to catch small animals, as hares or rabbits; a net; a trap; that which may entangle or bring into trouble: V. to entrap; to entangle; to bring into unexpected evil. SNAR'ING, imp. SNARED, pp. *snärd.* SNAR'ER, n. *-ėr,* one who snares. SNAR'Y, a. *-ĭ,* entangling; insidious.

SNARL, v. *snârl* [Low Ger. *snarren,* to whirr like a spinning-wheel, to grumble: Ger. *schnarren,* to make a harsh noise like a rattle or a string jarring: Icel. *snörgl,* a rattling sound in the throat]: to growl, as an angry or surly dog; to utter grumbling sounds; to speak roughly or sharply: N. the suppressed noise made by an angry or surly dog; a low subdued growl. SNARLING, imp. *snârl'ĭng:* ADJ. growling; snappish; peevish. SNARLED, pp. *snârld.* SNARLER, n. *snârl'ėr,* a surly grumbling fellow.

SNARL, v. *snârl* [Icel. *snara,* to twist]: in *OE.,* for ENSNARL, to twist silk; to entangle; embarrass: N. entanglement; difficulty.

SNARY. See under SNARE.

SNATCH, v. *snăch* [from SNACK, which see]: to catch at quickly and eagerly; to snap up; to seize abruptly without permission or ceremony; to attempt to seize hastily or suddenly: N. a hasty catching or seizing, or an attempt to do so; a short fit of vigorous action; a short fit or turn; a small part of anything; a broken part; broken or interrupted action; in *OE.,* a shuffling answer; a quip. SNATCH'ING, imp. SNATCHED, pp. *snăcht.* SNATCHER, n. *snăch'ėr,* one who snatches. SNATCH'INGLY, ad. *-lĭ.* SNATCH-BLOCK, among *seamen,* a pulley having an opening in one side for receiving the bight of a rope. —SYN. of 'snatch, v.': to catch; pull; drag; twitch; pluck; grasp; gripe; seize.

SNATH, n. *snâth* [AS. *snad*—from *snidham,* to cut]: helve of a scythe.

SNATHE, n. *snāth:* the helve of a scythe: V. to lop, to prune.

SNEAK, v. *snēk* [AS. *snícan;* Swiss, *schnaken;* Gael. *snàig,* to creep, to crawl: Dan. *snige,* to sneak, to slink]: to steal away privately; to withdraw meanly, as if afraid or ashamed to be seen; to slink; to act with meanness or servility; to truckle; in *OE.,* to hide; to conceal: N. a mean truckling fellow; a mean servile time-server. SNEAK'ING, imp.: ADJ. mean; crouching; servile. SNEAKED, pp. *snēkt.* SNEAKER, n. a mean spiritless fellow; a sneak; in *OE.,* a small vessel of drink; a punch-bowl. SNEAK'INGLY, ad. *-lĭ.* SNEAK-CUP, n. *-kŭp,* one who sneaks from his cups; a toper who balks his glass, hence a mean, sneaking, paltry person. SNEAK-UP, same as SNEAK-CUP.

SNEAP, v. *snēp* [Dut. *snippen,* to nip: Dan. *snibbe,* to reprimand: prov. Dan. *sneve,* to clip: Norw. *snikka,* to cut (see SNUB)]: in *OE.,* to nip with cold; to rebuke; to cut short; to reprimand: N. a rebuke; a reprimand. SNEAP'ING, imp. SNEAPED, pp. *snēpt.*

SNEB, v. *snĕb* [see SNEAP]: in *OE.,* to rebuke; to chide. SNEB'BING, imp. SNEBBED, pp. *snĕbd.*

SNECK, n. *snĕk* [probably connected with SNAP]: in *Scotch,* a latch: also SNICK and SNIB.

SNEE'HÄTTEN. See NORWAY.

SNEER, v. *snēr* [Dan. *snærre,* to grin like a dog: Low Ger. *snarren,* to mutter, to grumble]: to show contempt by a particular expression of the countenance, as by turning up the nose; to speak or utter with grimace: N. the manifesting of contempt by turning up the nose or laughing ironically; a look of disdain or ridicule. SNEER'ING, imp.: ADJ. manifesting contempt by turning up the nose, or by a significant look. SNEERED, pp. *snērd.* SNEER'INGLY, ad. *-lĭ.* SNEER'ER, n. *-ėr,* one who sneers.—SYN. of 'sneer, n.': scoff; gibe; grimace; scorn.

SNEEZE, v. *snēz* [Dut. *niezen;* Ger. *niesen,* to sneeze: O. Icel. *hniosa,* to sneeze—said of cattle: Dan. *snuse,* to sniff: Gael. *snaois;* Scot. *sneeshin,* snuff]: to send forth a sudden and violent rush of air, through the mouth and the nose, by a convulsive effort, caused by irritation of the inner membrane of the nose: N. the act of throwing out from the nose and mouth, by a convulsive effort, a violent and sudden rush of air. SNEEZ'ING, imp.: N. a sudden and violent rush of air, chiefly from the nostrils. SNEEZED, pp. *snēzd.* SNEEZEWORT, a plant having a strong pungent smell; the *Achillēă ptarmĭcă,* ord. *Compositæ.*

SNEEZE-WEED: any one of the composite genus *Helenium,* as *H. autumnale,* a tall, rank-growing sunflower-like plant. It has a few long-rayed yellow heads, with protruding disks appearing in autumn, and is occasionally cultivated, although it is very coarse, with square, winged stems and alternate large punctate entire or dentate leaves. These and the flowers are bitter, acrid, and pungent, and when dried and powdered cause vio-

lent sneezing, having been used in materia medica for this purpose. Sneeze-weed is generally avoided by cattle, but animals unfamiliar with, or developing a taste for it, are often poisoned by it.

SNEEZE-WOOD: a valuable wood, yielded by the large South African tree *Pteroxylon utile* of the order *Sapindaceæ,* and brought to market in logs sometimes 80 ft. long and 4 ft. in diameter. It is very difficult to work on account of its great hardness, and the dust arising causes much sneezing (whence the name), but it is handsome, with a yellowish grain resembling sandal-wood, durable, and avoided by white ants and shipworms.

SNEEZE-WORT: a composite herb, *Achillea ptarmica,* with larger and fewer white flowers than has the common yarrow of the same genus, and finely serrate linear leaves, which, when dried and pulverized, are said to provoke sneezing. It is a European plant introduced into America.

SNELL, n. *snĕl* [etym. doubt.]: a short line of horse-hair, gut, etc., by which a fish-hook is attached to a line; a snood.

SNELL, a. *snĕl* [AS. *snel,* quick, active]: in *OE.,* alert; brisk; in *Scot.,* biting; severe; sharp; cold, as wind.

SNELL EXHIBITIONS: scholarships founded 1677 by John Snell of Uffeton, Warwick, England, for the education of Scottish students at the University of Oxford. Snell was born in the parish of Colmonell, in Ayrshire, 1629, and entered the University of Glasgow 1644, and removed to England, where he held legal offices. He died at Holywell, near Oxford, 1679, leaving his estate for the foundation of the scholarships (now 14) which bear his name. The exhibitioners, nominated by the College of Glasgow, receive about £110 annually each during five years: candidates must be natives of Scotland, or sons of fathers born in Scotland; there are other conditions. The list of exhibitioners includes many eminent names.

SNELLING, Fort: a small town and military post on the right bank of the Mississippi river, in Hennepin co., Minn. The fort was established in 1819 and is situated just above the mouth of the Minnesota river, and about 6 m. s.w. of St. Paul. It is on the Chicago, Milwaukee & St. Paul railroad.

SNIB, v. *snĭb* [Dan. *snibbe,* to reprimand (see Sneap)]: in *OE.,* to check; to nip; to reprimand; in *Scot.,* to fasten a door with a bolt: N. in *Scot.,* a small bolt to fasten a door. Snib'bing, imp. Snibbed, pp. *snĭbd.*

SNICK, v. *snĭk* [Norw. *snicka,* to cut, to work with a knife]: in *OE.,* to make a small cut or mark: N. a small cut or mark, as with a knife; a latch. Snick'ing, imp. Snicked, pp. *snĭkt.* Snick and snee, a Flemish combat with knives.

SNICKER, v. *snĭk'ėr* [Scot. *nicker*, to neigh, to laugh in a loud ridiculous manner; *snocker*, to breathe high through the nostrils—an imitative word]: to laugh with broken half-suppressed catches of voice: N. a half-suppressed broken laugh. SNICK'ERING, imp. SNICK'ERED, pp. *-ėrd.*

SNI'DER RI'FLE: breech-loading firearm, the principle of which was applied (1867) to the Enfield rifle, then in use in the British army. The breech mechanism consists of a simple block containing an oblique needle; the block, being hinged on the right side, is opened by means of a thumb-piece. The cartridge, first of paper, afterward of thin sheet-brass, with detonator in the base, is inserted in the breech, and the latter is then closed. The rifle is discharged by pulling a trigger, which, by releasing a hammer, drives the needle into the base and explodes a detonator.

SNIDER, JACOB: American inventor: d. 1866, Oct. 25. He was the inventor of a method for converting the Enfield muzzle-loading rifles into breech-loaders. For a time he resided in Philadelphia, where he was a wine merchant, but giving up this occupation, busied himself with inventions. In 1859 he went to England and succeeded in selling his breech-loading gun to that government, but for unforeseen reasons failed to obtain his expected remuneration. He also improved devices for dyeing, brewing, coach-wheels, sheathing of ships, etc.

SNIFF, v. *snĭf* [Dan. *snive*, to sniff: Sw. *snyfta*, to sob (see SNUFF)]: to draw air audibly up the nose; to scent or smell: N. the act of sniffing; perception by the nose; the sound produced by sniffing. SNIF'FING, imp. SNIFFED, pp. *snĭft.* SNIFT, v. *snĭft*, to snort. SNIFT'ING, imp. SNIFT'ED, pp. SNIFTING-VALVE, in a steam-engine, relief valve which allows the escape of a fluid, or a gas, when a definite amount of pressure is attained. In condensing engines it allows the steam and air which mingle in the blowing-through process, to pass out of the cylinder. In some gas engines, it is employed to regulate the amount of the charge admitted to the combustion chamber. SNIFFLE, v. *snĭf'fl*, to snuffle, as one does with a severe cold in the head affecting the nostrils.

SNIGGER, v. *snĭg'gėr:* a form of SNICKER, which see.

SNIGGLE, v. *snĭg'gl* [AS. *snícan*, to creep (see SNAKE)]: to fish for eels by thrusting the bait into their holes; to catch; to snare. SNIG'GLING, imp. *-glĭng.* SNIG'GLED, pp. *-gld.* SNIG, n. *snĭg*, in *prov. Eng.*, an eel.

SNIP, v. *snĭp* [Dut. *snippen*, to snip or clip: Ger. *schnippen*, to snap—an imitative word, representing the sharp click of a pair of blades]: to cut off at once, as with scissors; to clip; to cut into small pieces; to snap: N. a single cut; a bit cut off; a small shred; *familiarly*, a tailor. SNIP'PING, imp. SNIPPED, pp. *snĭpt.* SNIP'PER, n. *-pėr*, one who snips. SNIP-SNAP, a conversation carried on in tart, quick replies.

SNIPE: certain limicoline birds of the family *Scolopacidæ*. The names snipe and sandpiper are, to a large extent, used interchangeably, many of the species, more properly designated as sandpipers, having also one or more local names of which snipe forms a part. Besides the woodcock, which is closely related, four species properly known as snipes occur in North America. All of these, together with numerous species inhabiting other parts of the world, have the bill very long, much exceeding the head, grooved for its entire length, somewhat flexible, flattened and expanded at the end and there richly provided with nerves and sense-organs. Because of these peculiarities these birds are enabled to employ the bill at once as a delicate, sensitive probe for exploring the mud deeply, and as a forceps for extracting worms and similar articles of diet which they there detect. The slit of the mouth is almost totally confined to the bill; the nostrils are rather large and placed very far back, almost above the eyes and not directly in front of them as in most birds. The typical snipes belong to the genus *Gallinago*. The only properly North American species is the well-known and favorite Wilson's snipe, *Gallinago delicata*, also known as the snipe, jack-snipe, American snipe, and, through mistaken identity, as the English snipe. Its length varies from 10 to 11½ inches, the smaller birds being females, and its color a mottled mixture of various browns, black, and white, giving a dark effect above, white below. There are 16 tail quills. Like most species of the family, it breeds northward, from the extreme northern United States to beyond the Arctic Circle. Within the United States it is widely distributed, during the spring migrating from March to May, and more abundantly in the fall from September to November. It frequents open marshes, both fresh and salt, and is consequently chiefly an inland bird, and is plentiful in the central west. In its southward journey it reaches the West Indies and South America, but seems less sensitive to cold than many of its relatives; and individuals sometimes haunt the vicinity of open springs during the prevalence of severe frosts both in the late fall and early spring. Unlike the bay birds the snipe is mostly solitary and never forms large flocks. Night is its chief season of activity, when it flies and migrates and to a great extent feeds. The soft ground in its haunts is probed in all directions for worms, insects, larvæ, and similar creatures which, with snails and slugs, are consumed in great quantities. When flushed it utters a loud, rather harsh note and flies rapidly and very irregularly for 20 or 30 yards before setting a direct course. During the mating and nesting season these birds are much about by day and are said to perform remarkable aerial evolutions, often dropping swiftly from a height with a peculiar drumming sound caused by the air rushing through the wings. The nest is a mere depression in the ground, lined by a few grasses or leaves, usually in

the shelter of a tussock or bush in a bog. The eggs are four and of the pyriform shape usual in the family and grayish-olive tinged with brown and blotched with browns.

Of the genus *Macrorhamphus,* in which the toes are slightly webbed, the legs more largely naked than in *Gallinago,* the wings longer and more pointed, and the summer and winter plumages different, we have two species, *M. griseus,* the eastern dowitcher, and *M. scolopaceus,* the western or long-billed dowitcher. The former is known in the summer plumage as the red-breasted, the latter as the red-bellied snipe, which, with the differences in the bill and the generic characters sufficiently distinguishes them. Their habits are similar and their breeding habits are essentially those of Wilson's snipe. Within the United States they frequent the sea-coasts, flying in dense but not large flocks and associating with various sandpipers and yellow-legs. Their most distinctive traits are their confiding nature, proficiency as swimmers, swift flight and compact flocking. To the first and last of these is due their destruction in great numbers by bay-bird gunners, with whom they are great favorites.

Among European species of snipes may be mentioned the common or English snipe, *G. gallinago,* scarcely distinguishable from Wilson's snipe, except that it has only 14 tail feathers, and the great or solitary snipe, *G. major,* both of which have appeared as stragglers in North America. Consult: Baird, Brewer and Ridgway, *Water Birds of North America,* Vol. I. (Boston, 1884); Leffingwell, *Shooting on Upland, Marsh and Stream* (New York, 1887); Elliot, *North American Shore Birds* (New York, 1895); Sanford, *Water Fowl Family* (New York, 1903).

SNIPE-EEL: a small, excessively slender, scaleless, translucent fish of the deep seas, with jaws prolonged into a slender bill, like a snipe's, the upper mandible somewhat recurved. There are many species, which form the family *Nemichthidæ,* closely related to typical eels, but little is known of their habits.

SNIPE-FISH: a small fish, *Centriscus scolopax,* of the Mediterranean and neighboring waters, whose snout is prolonged into a tube suggesting a snipe's bill.

SNIPE'-FISH. See TRUMPET-FISH.

SNITE, v. *snīt* [see SNOT and SNOUT]: in *OE.,* to wipe the nose; to snuff, as a candle.

SNITE, n. *snīt* [see SNIPE]: in *OE.,* a snipe.

SNIVEL, v. *snĭv'l* [from SNIFF, which see: Dan. *snövle,* to snuffle: Dut. *snuffelen,* to smell out]: to draw up the mucus audibly through the nose; to run at the nose with mucus: N. mucus running from the nose. SNIV'ELLING, imp. *-lĭng:* ADJ. running at the nose; crying; lamenting: N. a crying, as of children, with snuffling or whining. SNIV'ELLED, pp. *-ld.* SNIV'ELLER, n. *-lẽr,* one who weeps from trivial causes. SNIV'ELLY, a. *-lĭ,* dirty at the nose; pitiful; whining.

SNIZORT, LOCH, *lŏch snī'zĕrt:* large, picturesque inlet of the sea, in n.w. of the island of Skye. At its head the loch is only a few furlongs broad, but gradually expands to more than 7 m. at its entrance. It is 13 m. long.

SNOB, n. *snŏb* [prov. Eng. *snob,* an ignorant person, a journeyman shoemaker: Scot. *snab,* a cobbler: Icel. *snapr,* an idiot, an impostor]: a vulgar person who apes gentility; one who is always pretending to be something better; one who works for lower wages than other workmen, especially one who works in a shop out on strike; in *university slang,* a townsman. SNOB'BISH, a. *-bĭsh,* pertaining to or befitting a snob. SNOB'BISHLY, ad. *-lĭ.* SNOB'BISHNESS, n. *-nĕs,* the character or habits of a snob. SNOB'LING, n. a little snob. SNOB'BERY, n. *-bĕr-ĭ,* the manners or character of a snob.

SNOD, a. *snŏd* [Scot. *snod,* to prune, to put in order: Icel. *snúdr,* a twist, a twirl; *snua,* to twist: comp. Gael. *snuadh,* color, adornment]: in *Scot.,* trimmed; put in order; neat; demure. SNOOD, n. *snôd,* in *Scot.,* the fillet or ribbon which binds up the hair among women.

SNOILSKY, KARL JOHAN GUSTAF, Fount: Swedish poet: b. Stockholm, 1841, Sept. 8. He was educated at the University of Upsala, in 1865 entered the diplomatic corps and served with distinction until 1879, when he abandoned diplomacy for literature. His chief works are: *Orchideer* (1862); *Dikter* (1876); *Nya Dikter* (1881); *Dikter: 3e Samlingen* (1883); *Dikter: 4e Samlingen* (1887); and also a translation of Goethe's ballads (1876).

SNOOZE, v. *snôz* [Lith. *snusi,* to doze: Bav. *pfnausen,* to breathe deep through the nose: Dan. *snuse,* to sniff]: to slumber; to nap; to doze: N. a comfortable short sleep; a nap. SNOOZ'ING, imp. SNOOZED, pp. *snôzd.*

SNORE, v. *snōr* [O.Dut. *snorren,* to grumble, mutter. Swiss, *schnodern,* to snore: Low Ger. *snurre,* the nose; *snurren,* to whirr like a spinning-wheel, to snore in sleep. Ger. *schnarchen,* to snore: Sw. *snor,* mucus from the nose]: to breathe through the open mouth in sleep with a rough hoarse noise. Such an abnormal and noisy mode of respiration is produced by deep inspirations and expirations through the nose and open mouth, the noise being caused by the vibrations of the soft palate and uvula. N. a hoarse rough breathing through the nose and mouth in sleep. SNOR'ING, imp. SNORED, pp. *snōrd.* SNOR'ER, n. *-ĕr,* one who snores.

SNORRO STURLUSON. See STURLUSON, SNORRI; EDDA.

SNORT, v. *snŏrt* [from SNORE, which see]: to force the breath through the nose with violence and noise, as a horse in prancing and playfulness: N. a forcible blowing of air through extended nostrils, as a horse. SNORT'ING, imp.: N. act of forcing air through the nose with noise. SNORT'ED, pp. SNORT'ER, n. *-ĕr,* one who snorts.

SNOT, n. *snŏt* [Low Ger. *snotte;* Dut. and Dan. *snot;* mucus of the nose]: the mucus discharged from the nose; a rude and vulgar person: V. *vulgarly,* to blow the nose. SNOT'TING, imp. SNOT'TED, pp. SNOT'TY, a. *-tĭ,* foul with mucus from the nose; *familiarly,* crabbed; peevish; sneering. SNOT'TINESS, n. *-tĭ-nĕs,* the state of being snotty. SNOT'TER, v. *-tĕr,* to snivel.

SNOTTER, n. *snŏt'ĕr* [etym. doubt.]: in *naut.,* a rope passing over a yardarm, to bend a tripping line to, in sending down topgallant and royal yards in vessels of war; the short line supporting the heel of the sprit in a small boat.

SNOUT, n. *snowt* [Icel. *snudr;* Sw. *snut;* Bav. *schnud;* Low Ger. *snute;* Dan. *snude;* Dut. *snuit,* the snout]: the projecting nose of a beast; the human nose, in contempt; the nozzle of a pipe: V. to furnish with a nozzle. SNOUT'ING, imp. SNOUT'ED, pp.: ADJ. having a snout. SNOUT'Y, a. *-ĭ,* resembling a snout.

SNOW, n. *snō* [Ger. *schnee;* Icel. *sniór;* Dan. *snee;* Sw. *snö;* Goth. *snaivs;* Gael. *sneachd;* Gr. *nips* or *nipha,* snow]: congealed moisture or vapor of the atmosphere, in the form of light white flakes, of very beautiful and perfect forms (see below): V. to fall in snow; to scatter like snow. SNOWING, imp. SNOWED, pp. *snōd.* SNOWY, a. *snō'ĭ,* abounding with snow; white like snow; spotless; unblemished. SNOW'ISH, a. *-ĭsh,* resembling snow. SNOW'LESS, a. *-lĕs,* without snow. SNOW BALL, a round mass of compressed snow: V. to throw snow-balls; to pelt with snow-balls. SNOW-BALL TREE (see GUELDER-ROSE). SNOW-BLANKET, the name given by farmers and others to any considerable thickness of snow which covers the ground during winter. SNOW-BLINDNESS, an affection of the eyes, caused by the reflection of light from the snow. SNOW-BLINK: see SNOW-LIGHT. SNOW-BROTH, a mixture of snow and water; a very cold liquor. SNOW-CAPPED, a. covered with snow, as a hill or mountain. SNOW-DRIFT, a bank formed of snow driven together by the wind. SNOW-FLAKE, a flake or feathery particle of snow; plant (see below). SNOW-LIGHT, or -BLINK, the name given by voyagers and travellers in the arctic regions to the peculiar reflection which arises from field of ice or snow. SNOW-LINE, that line or limit of elevation at and above which the surface is perpetually covered with snow and ice (see below). SNOW PLOW, machine for clearing railways and roads from accumulations of snow. SNOW-SHOE, a boat-like framework fastened on the foot to prevent sinking in deep snow (see SNOW-SHOES). SNOW-SLIP, a mass of snow which slips down the side of a hill or mountain. SNOW-STORM, a heavy, drifting fall of snow. SNOW-WHITE, a. very white SNOWWREATH, an accumulation of snow of some length.

SNOW, n. *snō* [Low Ger. *snau,* a beak]: a vessel with two masts; a brig.

FORMS OF SNOW CRYSTALS.

SNOW: frozen moisture which falls from an atmosphere whose temperature is 32° F. or lower. It is composed of crystals, usually in the form of six-pointed stars, of which about 1,000 different kinds have been observed, and many of them figured, by Scoresby, Glaisher, and others. These numerous forms have been reduced to the following five principal varieties—1. Thin plates, most numerous class, containing several hundred forms, of exquisite beauty (figs. 1 to 6). 2. A spherical nucleus or plane

Fig. 1. Fig. 2. Fig. 3. Fig. 4.

figure studded with needle-shaped crystals (fig. 8). 3. Six or, more rarely, three-sided crystals. 4. Pyramids of six sides (fig. 9). 5. Prismatic crystals, having at the ends and middle thin plates perpendicular to their length (fig. 7). The crystals in the same fall of snow are generally of the same form. The crystals of hoar-frost being formed on leaves and other bodies disturbing temperature, are often irregular and opaque; and it has been observed that each tree or shrub has its own peculiar crystals. S.-flakes vary from an inch to $\frac{7}{100}$ of an inch in diameter, the largest occurring when the temperature is near 32°, and the smallest at very low temperatures. As air has a smaller capacity for retaining its vapor as the temperature sinks, it follows that the aqueous precipitation, S. or rain, is much less in polar than in temperate regions. The white color of

Fig. 5.

S. is the result of the combination of the different prismatic rays issuing from the *minute* snow-crystals. Pounded glass and foam are analogous cases of the prismatic colors

blending together and forming the white light out of which they had been originally formed. Also the air contained in the crystals intensifies the whiteness of the snow: see RED SNOW. The limit of the fall of snow near sea-level coincides nearly with the mean winter temperature of 52° F., since in places where the mean winter tempera-

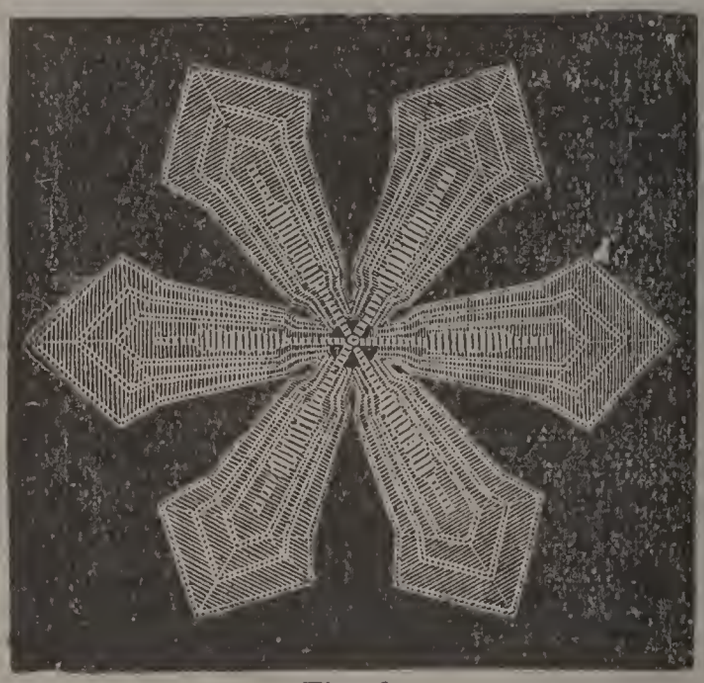
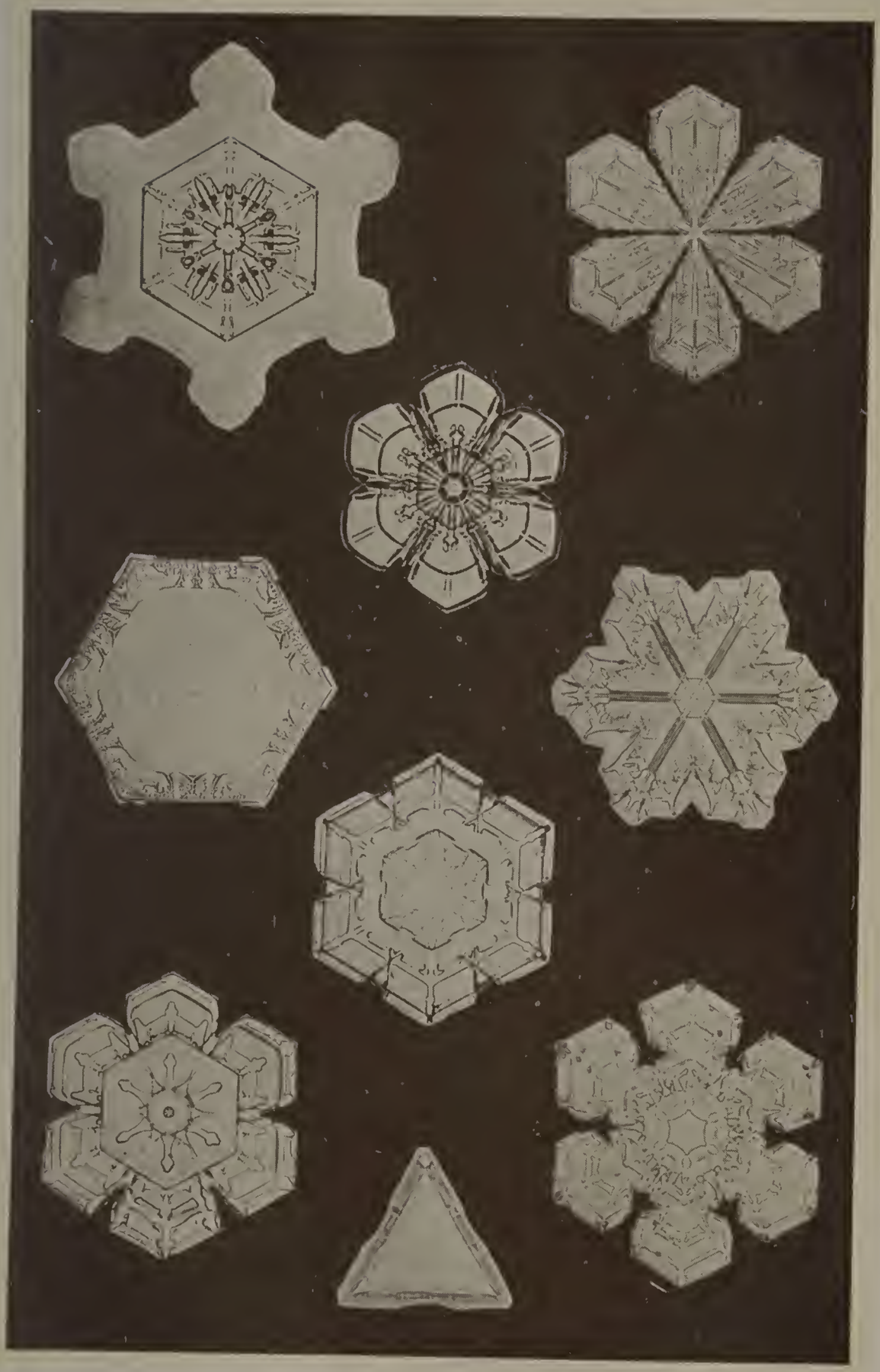


Fig. 6.

ture is no higher than 52°, that of the air falls sometimes to 32°. In N. America the s. S. limit is Savannah, New Orleans, the mouth of the Rio Grande, the head of the Gulf of California, and San Francisco: in Europe it is not far n. of Gibraltar. At Paris, S. falls, on an average, 12 days in a year; at St. Petersburg 170 days. In Charleston, S. C., the mean days of S. per year are 2, mouth of the

Fig. 7. Fig. 8. Fig. 9.

Columbia river 7, St. Louis 11, Cape Henry 13, Detroit 34, Winnipeg 54, Halifax 64, Quebec 66. The largest falls of S. are in the Antarctic regions. S. is 10 to 12 times lighter than an equal bulk of water. From its loose texture, and its containing about 10 times its bulk of air, it is a very poor conductor of heat, and thus forms an admirable covering for the earth from the effects of radiation—so that frequently, in times of great cold, the soil is 40° warmer than the surface of the overlying snow The flooding of rivers from the melting of the S. on mountains in summer, carries fertility into regions otherwise barren. See SNOW-LINE: GLACIER: METEOROLOGY (and its references)



FORMS OF SNOW CRYSTALS.

SNOW, Francis Huntington: American naturalist: b. Fitchburg, Mass., 1840, June 29; d. 1908, Sept. 20. He was graduated from Williams College in 1862 and from Andover Theological Seminary in 1866, at which time he was called to the University of Kansas, then established, as professor of mathematics and natural history. In 1886 Snow Hall of Natural History was established in his honor, and in 1890 he was made chancellor of the university and professor of entomology. He was also known in the field of ornithology and meteorology, but was most prominent as the discoverer of a fungus destructive to the chinch bug, a pest of wheat fields and other crops.

SNOW, Lorenzo: Mormon apostle: b. Mantua, Ohio, 1814, Apr. 3; d. Salt Lake City, Utah, 1901, Oct. 10. He studied at Oberlin College, but was converted to Mormonism through the preaching of Joseph Smith in 1836, and became a Mormon elder and missionary of the Church of the Latter Day Saints. In 1849 he was proclaimed one of the Twelve Apostles of the Mormon faith, and during the periods between the migrations of his people was identified with its attempts at public education. He was the founder of Brigham City, Utah, whose industrial system he organized on the co-operative plan. In 1898 he was elected president of the Mormon Church. He translated the Book of Mormon into Italian, and was the author of: *The Only Way to be Saved* (1851); *The Voice of Joseph;* and other Mormon books.

SNOW-BALL, or Guelder Rose: any one of the varieties of several species of *Viburnum* (*Caprifoliaceæ*) in which the flowers are all sterile and showy. The cranberry bush, *Viburnum opulus,* is the original snow-ball, common to Europe and America, and a handsome shrub, often 12 feet in height, with grayish bark, and alternate three-lobed leaves. The flowers are normally arranged in peduncled cymes, the central florets being small, 5-merous, and fertile, surrounded by a few neutral flowers, with flat, white corollas expanded to an inch in breadth. The cultivated form of this is a sport, where all the flowers are sterile and expanded into snowy spherical masses. Certain similar Japanese and Chinese sports of *V. tomentosum* and *V. macrocephalum* have been introduced into America, the latter having flower-heads nearly as large as those of hydrangeas, and both being hardy, tall, strong- growing shrubs with handsome foliage. They are supplanting the old-fashioned *V. opulus,* which suffers from *aphis.*

SNOWBERRY (*Symphoricarpos racemosus*): bushy deciduous shrub of nat. order *Caprifoliaceæ,* native of n. parts of N. America, on wild, rocky banks, most common in w. and s. United States, and now common in British shrubberies. It has simple leaves and small white or somewhat rosy flowers, in interrupted leafy spikes, blooming all summer; berries about the size of black

currants, remaining on the bush after the leaves, quite white, but uneatable.—The name SNOWBERRY is given also to the creeping Snowberry (*Chiogenes hispidula*) of peat-bogs and low woods in the n. United States; it has small evergreen leaves, rusty bristled below, and these and the berries have a wintergreen flavor.

SNOW-BIRD: name applied in the United States either to the Snow-bunting (q.v.) or to the much more common *Junco hiemalis*, which differs strikingly in being of dark slate color except the white belly, the slate color ending abruptly at the lower part of the breast. It occurs everywhere in N. America, in flocks, during the cold weather, when its summer song is reduced to a chirp. It makes itself at home in the vicinity of houses and in barnyards, taking refuge from extreme cold in haystacks or other shelter. There are other species of the same genus.—The name Snow-finch, though applicable to the Snow-bird and the Snow-bunting, is used for a European bird resembling the Snow-bunting, but of another genus; it is the *Montifringilla nivalis*, and is called also the Stone-finch or Mountain-finch.

SNOW-BUNTING, or SNOW'FLECK (*Plectrophanes nivalis*), also called Snow-flake, Snow-flight, etc.: bird of the Bunting family (*Emberizidæ*), of genus distinguished from true buntings by the long and nearly straight claw of the hind-toe, in this resembling the larks. There is an approach to larks in habits also; there is similar ease and celerity in running on the ground, and the song is very different from that of any of the true buntings. The Snow-bunting is white, with bill, back, and more or less of the wings and tail black or blackish, and often is varied with rich brown; abounds in summer in all parts of the arctic regions, and in winter in more s. countries of N. America, Europe, and Asia. Linnæus says it is the only living creature that has been seen 2,000 ft. above the limits of perpetual snow on the mountains of Lapland. Great flocks are seen in Britain, particularly in severe winters, usually in uplands in mild weather, but descending to the low grounds and seashore in hard frosts. The nest is placed on the ground, or in a crevice of a rock.—The Snow-bunting is generally very fat, and highly esteemed for the table. The Greenlanders kill great numbers, and dry them for winter use.

SNOWDON, *snō'don:* mountain-range in Caernarvonshire, N. Wales; stretches n.e. by n. from a point 5 m. n. of Cricceith, near the head of Cardigan Bay, to near Conway; but broken by valleys and river-courses into four mountain groups, whose chief peaks are Carnedd-Llewelyn, 3,460 ft.; Moel-Siabod, 2,878 ft.; and *Moel-y-Wyddfa* ('the Conspicuous Peak'), highest mountain in s. Britain, 3,571 ft. above sea-level. Seen from the top, Moel-y-Wyddfa, the 'King of Snowdonia,' appears to send out three ridges, which gradually divide and sub-divide, giving birth to numerous valleys and corries. The ascent

of the highest peak of Snowdon is effected by tourists from Llanberis (on the n.), Beddgelert (on the s.), Llyn Cwellyn (on the w.), and Capel Curig (on the e.); the first is shortest and easiest; the last is longest, most difficult, but far the grandest. The district of 'Snowdonia' was made a royal forest by Edward I. of England, but was disafforested 1649.

SNOW'DROP (*Galanthus*): genus of plants of nat. order *Amaryllideæ*, of same tribe with Amaryllis, Snow-flake, Crinum, etc. The three outer segments of the perianth spread, so as to make a bell-shaped flower; the three inner are shorter, erect, and notched at the summit. The flowers arise from a spathe. The root is bulbous, and produces two leaves and one single-flowered leafless stem (*scape*). The Common Snowdrop (*G. nivalis*) is native chiefly of s. Europe, growing in woods and pastures. It has long been cultivated in gardens.—Another species of Snowdrop (*G. plicatus*), with much broader leaves, is found in s. Russia and in Asiatic Turkey.

SNOWDROP TREE, or SILVER-BELL TREE (*Halesia*): genus of trees or shrubs of the Storax family (*Styracaceæ*), named from the white bell-shaped flowers which appear before the leaves, and are mostly strung on drooping branches. *H. tetraptera*, found on streams as far n. as the Ohio river, is hardy in cultivation; it has four-winged fruit. *H. diptera* has the leaf-serrations coarse, and the fruit two-winged; it flourishes only at the south, in lowlands.

SNOW-FLAKE (*Leucoium*): genus of European plants, introduced from Europe and cultivated in gardens. It resembles much the Snowdrop, but is larger, flowers late, with the flower-stalk more leafy at the base, and the leaves bright green. The spring Snow-flake (*L. vernum*) is one foot high and one-flowered, with a hexagonal pear-shaped pod. The Summer Snow-flake (*L. æstivum*) has 3-7 larger flowers, with rounder pod.

SNOW'-LINE: limit of height above sea-level below which all the snow that falls annually melts during summer; higher than this line is the region of perpetual snow. No general rule for the height of this line can be given, owing to the different causes which may determine it. These are—distance from the equator; situation of the slope in respect of the sun's rays, whence, other things being equal, the snow-line is (in n. latitudes) higher on the s. than on the n. side of mountains; situation with respect to rain-bringing winds; steepness of the slope; and dryness or humidity of the region. Nevertheless, it may be said generally that the snow-line sinks little from the equator to lat. 20° n. or s.; from 20° to 70° it continues to fall equally; but from 70° it falls rapidly to 78°, where it is at sea-level.

To this general statement there are important exceptions. The snow-line is about 4,000 ft. higher on the n.

than on the s. side of the Himalaya, owing to the greater depth of snow that falls on the s. side; to the greater dryness of the climate of Tibet, which increases the evaporation and the heating power of the sun's rays; and to the naked rocks and soil of the n. absorbing more heat than surfaces covered with vegetation. It is higher in the center of continents than near the coasts (the rain being less, and the heat greater), as seen on comparing the Pyrenees and Caucasus; and on the e. than on the w. coasts of continents, which is strikingly illustrated by Kamtchatka (snow-line 5,249 ft.) and Unalashka (3,510), situated respectively on the w. and e. coasts of the n. Pacific. South of the equator it rises from 0° to 18° very considerably, and more so on the w. than on the e. of the Cordilleras, owing to the small amount of rain and snow which falls on the w. of these mountains. It is as high in 33° s. lat. as in 19° n. lat.; but s. of this it sinks very rapidly, so that in the s. of Chili it is 6,000 ft. lower than in the same latitude in the Rocky Mountains, and 3,000 lower than in w. Europe. The mean temperature of the snow-line varies much from the equator to the pole—from 35° to 20° F. In the Alps it is about 25°; and in Norway about 23°.

The following are the observed heights of the snow-line in English feet, in different parts of the globe:

	N. Lat.	Height.
Spitzbergen	78	0
Sulitelma, Lapland	67	3,835
Kamtchatka	59½	5,249
Unalashka, W. America	56½	3,510
Altai	50	7,034
Alps	46	8,885
Caucasus	43	11,063
Pyrenees	42¾	8,950
Rocky Mountains	43	12,467
North Himalaya	29	19,560
South Himalaya	28	15,500
Mountains of Abyssinia	13	14,065
Purace, Colombia	2¼	15,381
	S. Lat.	Height.
Nevados of Quito	0	15,820
Orequipa, Bolivia	16	17,717
Pauchuta, Bolivia	18	20,079
Portillo, Chili	33	1,473
Cordilleras, Chili	42½	6,010
Magellan Strait	53½	3,707

SNOW-OWL: a large owl, *Nyctea nyctea*, a native of the north of Europe, Asia, and America. In old birds the plumage is occasionally pure white, but in younger and most adult birds each feather is tipped with dark brown or black. The length of the adult male is about 20 inches, that of the female four or five inches more. This is one of the largest of the owls, and is at once distinguishable from the great horned owl, the only other species of equal size which occurs commonly in the United States, by the absence of ear-tufts. It breeds altogether north of the United States, and while it is quite capable of enduring the cold of Arctic winters, a larger or smaller number migrate southward, but most irregularly,

every winter. During some winters it is very rare, and sometimes very common in the middle states, and it may straggle quite to the gulf coast. The 5 to 8 large white elliptical eggs are laid in a nest built on the ground in a rocky spot. This is one of the most diurnal of the owls and frequently hunts by day, its prey being hares, grouse, ptarmigan, and similar mammals and birds, as well as rats and mice.

SNOW PLOW: a machine or implement used to clear snow from roads, tracks, and pathways. The simplest form for common highways consists of boards framed together so as to form a sharp angle, like the letter A in front, and spreading out behind to a greater or less width. Being drawn along with the apex in front, the snow is thrown off by the boards to the side of the road or path, and thus a free passage is opened for traffic. The snow plow in common use on urban street railways consists, roughly, of a heavy car on high trucks; underneath the floor of the car and before or behind each pair of wheels are huge rotary brushes, of cane, wood-fiber, or some stiff material. These brushes are set obliquely across the track, at right angles to each other, and are about two feet or a yard in diameter. When the car is in motion power is supplied (from the same source as the motive power), and the brushes rotating swiftly sweep the track clear of the snow, which is thrown to either side. This is further removed by means of side drags, or boards obliquely attached to the car and set edge up, on either side, the point of the angle which they make with the body of the car being directed to the front. Snow plows are in common use on the western and northern railroads in the United States and Canada. They are of many different patterns, the machinery for such purpose being improved and revised every year. They are constructed more or less on the same principle, which comprises pairs of rotary blades obliquely set in a drum casing open at the front end, and driven by horizontal shafts, the other ends of which are connected with machinery in the body of the car, from which the driving power is supplied. Such an engine is coupled to the locomotive, from which it draws the steam necessary for the operation of the plow through connecting pipes. Another locomotive is hitched behind to supply the moving power, then comes the train of cars, and, in many cases, behind these another locomotive to help in the pushing. By means of such contrivances the railroads have been enabled to operate through severe snowstorms, cutting through drifts which completely bury their tracks and which before the invention of the snow plow necessitated complete suspension of traffic. Snow plows have recently been introduced into Russia.

SNOW'-SHOES: species of foot-gear much used by inhabitants of regions where snow prevails for a great portion of the year. The Canadian snow-shoe consists of

a flat frame, of lanceolate form, ½ ft. wide and ⅗ ft. long. It is either wholly of wood, or is a long, narrow frame of pliable hickory, placed on edge, bent double with oval front and the two ends firmly fastened behind, filled in with wicker-work or thongs, and with cross-straps on the upper surface to attach it to the foot. The broad surface prevents the foot from sinking in the snow. The Norwegian snow-shoe is a thin board 5 to 10 ft. long, 3 in. wide, with the fore end slightly curved upward.

SNUB, v. *snŭb* [Dan. *snibbe,* to reprimand: Icel. *snubba,* to cut short: Sw. *snubba;* Fris. *snubbe,* to give a sharp reproof]: to check, to reprimand; to rebuke, particularly in a sarcastic manner; to slight; to treat with contempt; to nip. SNUB'BING, imp.: N. a sarcastic reprimand or rebuke. SNUBBED, pp. *snŭbd.* SNUB NOSE, a short or flat nose.

SNUDGE, v. *snŭj* [a form of SNUG, which see]: in *OE,.* to lie idle, close, or snug. TO SNUDGE ALONG, to walk looking downward with a poring, abstracted air. TO SNUDGE OVER THE FIRE, to keep close to it.

SNUFF, v. *snŭf* [O.Dut. *snuffen,* to breathe through the nose, to trace by scent: Ger. *schnaufen,* to snuff, to puff and blow: Low Ger. *snuffe,* the nose]: to draw in with the breath through the nose; to inhale; to perceive by the nose; to take off the burnt top of a candle; to inhale breath audibly; to draw up into the nostrils the powder of tobacco-leaf; to snift with the nose in contempt: N. that which is inhaled or drawn up through the nostrils; the charred end of a wick; a candle almost burnt out; tobacco-leaf reduced to powder for drawing up into the nostrils (see TOBACCO): resentment expressed by sniffing or snorting. SNUF'FING, imp. SNUFFED, pp. *snŭft.* SNUF'FER, n. *-fėr,* one who snuffs. SNUF'FY, a. *-fĭ,* soiled with snuff, or smelling of it. SNUF'FERS, n. plu. *-fėrz,* an instrument for taking off the charred wick of a candle. SNUFF-BOX, a small box or case for holding snuff intended for daily use. UP TO SNUFF, *familiarly,* not likely to be imposed upon; knowing; acute. SNUFFED OUT, overshadowed; eclipsed; put down; annihilated.

The practice of snuff-taking was introduced into Europe from America during the 16th c., and during this and the following century became very general throughout the continent and in England. Its use in England greatly increased under the reign of William and Anne, and in France under the various Louis. The practice, although almost entirely abandoned by the upper classes to-day, is more widely prevalent than is commonly thought. The consumption of the drug in the British Isles is said to amount to more than 900 tons annually. In the United States, where the consumption is about 9,500 tons a year, the chief users are foreign-born. The snuff used in this country is all of domestic manufacture, the small amount of French snuff imported not being worth considering.

Snuff-boxes, for retaining small quantities of the powder about the person are of great variety of shape and material. When snuff-taking was one of the habits of society these boxes were often of much value and beauty of workmanship. Gold, silver, and precious stones were employed in their manufacture, and some of the boxes of crowned heads and of the popes are famous for their workmanship. The ordinary boxes used by the snuff-takers to-day are of horn, papier-maché, or lacquered wood, and are made largely in France and Germany.

The habit of taking snuff is said to be one of the pleasantest of the many ways of using tobacco. The snuff, pinched up between the thumb and forefinger, is drawn into the nostrils by sharp, deep inhalations. In a few moments it produces a ticklish sensation, which frequently causes sneezing, and is highly gratifying to the user. The habit of 'dipping snuff,' at one time common among the poorer classes in the South Atlantic portions of the United States, consisted in holding in the mouth the well-chewed end of a dry twig, which had been dipped into powdered snuff. The habit is still prevalent in some sections.

SNUFFLE, v. *snuf'fl* [from SNUFF, which see: Dut. *snuffelen,* to breathe through the nose: prov. Ger. *schnüffeln,* to speak through the nose, to snuffle]: to speak through the nose; to breathe hard through the nose, especially when obstructed by mucus. SNUF'FLING, imp. *-flĭng:* N. a speaking through the nose. SNUF'FLED, pp. *-fld.* SNUF'FLER, n. *-flėr,* one who snuffles. SNUF'FLES, n. plu. *-flz,* obstruction of the nose by mucus.

SNUG, a. *snŭg* [Icel. *snöggr,* smooth, as wool or hair: Dan. *snög, snyg,* smart, neat: Sw. *snygg,* neat, cleanly]: warm and close; sheltered; concealed; not exposed to view; being in good order; neat and comfortable: V. to lie close or concealed. SNUG'GING, imp. SNUGGED, pp. *snŭgd.* SNUGLY, ad. *snŭg'lĭ.* SNUG'NESS, n. *-nĕs,* the state of being snug. SNUG'GERY, n. *-gėr-ĭ,* a neat, comfortable place. SNUG'GLE, v. *-gl,* to lie close; to nestle or cuddle. TO BE or LIE SNUG, to be close; to be slyly and comfortably concealed.

SNY, n. *snī* [comp. Dan. *snoe,* to twist]: among *ship-carpenters,* the upward bend of a ship's timbers toward the bow and the stern. SNYING, n. *snī'ĭng,* a term for a circular plank worked edgewise into the bow of a ship.

SNYDER, *snī'dėr,* SIMON: American military officer: b. Selin's Grove, Pa., 1839, Feb. 9. He was graduated from the United States Military Academy in 1861, and served in Sheridan's campaign during the Civil War. He was assigned to frontier duty after the war, and was brevetted major for gallantry in the field in 1890. At the outbreak of the Spanish War he was made brigadier-general of volunteers and placed in command of the first division of the First Army Corps in Cuba. In 1898

he was made military governor of the Cuban province of Santa Clara. The following year he was assigned to duty in the Philippines. In 1900 he served as inspector-general of the Department of the Lakes. In 1902 he was retired.

SNYDERS, or SNEYDERS, *snī'dėrz,* FRANCIS: Belgian painter of animals and still-life: 1579-1657; b. Antwerp. His style was formed in the school of Henry van Baelen. Originally, he confined himself exclusively to painting figures by Rubens, Jordaens, Honthorst, and Mierevelt. It is difficult to discover any difference of touch. For Philip III. of Spain he executed several hunting and battle pieces. Snyders knew how to give expression to the passions of the lower creation, and his bear, wolf, and boar fights are scarcely surpassable. The best specimens of the artist are in the galleries of Vienna, Munich, and Dresden; there are fine pictures of his in private English collections also. Snyders died at Antwerp.

SO, ad. conj. *sō* [Icel. and Goth. *sva;* AS. *swâ;* Ger. *so;* F. and It. *si;* L. *sic,* so: Gael. *so,* this or these; *so,* a prefix signifying facility, ease, goodness]: in like manner, when preceded or followed by *as;* in such manner, when followed by *that;* in this way, when followed by *as;* for this reason; this or that, as, I said *so;* thus; thus it is; provided that; in a high degree, as, he was *so* good; very, as, I am *so* sorry; as it appears, as, *so* you are going. SO FORTH, more of a like kind. SO SO, a familiar exclamatory phrase; well, well, implying discovery or observation; moderately or tolerably well; mediocre. SO THAT, to the end that. SO THEN, therefore; the consequence is. SO AND SO, used in speaking of a person, place, or thing to avoid identification. *Note.*—So sometimes repeats the sense of a word or sentence going before, as, 'to make men happy, and to keep them *so*'—that is, happy.

SOANE, Sir JOHN: English architect: b. Whitchurch, near Reading, 1753, Sept. 10; d. London, 1837, Jan. 20. He was a mason's son, and was for a time an errand boy, but having gained some architectural knowledge, won first the silver medal (1772) and afterward the gold medal (1776) of the Royal Academy, the latter for a design of a triumphal arch. In 1788 he was appointed architect to the Bank of England, and in 1791 clerk of works to Saint James' Palace, the Parliament Houses, and other public buildings. He was elected A.R.A. in 1795 and R.A. in 1802, and became professor of architecture to the Royal Academy in 1806. He was knighted in 1831, and at his death bequeathed his collection of works of art and $130,000 to the nation. The Soane Museum thus formed is housed at 13 Lincoln's Inn Fields, London, and contains antique sculptures, bronzes, gems, models of ancient buildings, a collection of pictures, etc. Consult: *Memoir,* by Britton (1834). He published plans of *Public and Private Buildings* (1828).

SOAK, v. *sōk* [AS. *sucan*, to soak: W. *swga*, soaked: Manx, *soo*, to suck up: Gael. *sùg*, to suck: Ger. *sogen*, to drip]: to cause to suck in wet or moisture; to steep; to wet thoroughly; to lie steeped in a liquor; to enter gradually into pores or interstices. SOAK'ING, imp.: ADJ. that wets thoroughly; drinking intemperately: N. a thorough wetting. SOAKED, pp. *sōkt*. SOAK'ER, n. *-ĕr*, a hard drinker. SOAK'AGE, n. *-āj*, state of being soaked. SOAK'Y, a. *-ĭ*, moist on the surface; full of moisture.

SOAP, n. *sōp* [Dut. *zeep;* Icel. *sápa;* Gael. *siabunn;* Dan. *sæbe;* Ger. *seife;* It. *sapone;* W. *sebon;* F. *savon;* L. *sapo;* Gr. *sapōn*, soap: Bret. *soav*, tallow]: an important article of household use, manufactured from oils or fats, and an alkali, as soda or potash: V. to rub with soap. SOAP'ING, imp. SOAPED, pp. *sōpt*. SOAPY, a, *sōp'ĭ*, smeared with soap; resembling soap. SOAP'INESS, n. *-ĭ-nĕs*, the quality of being soapy. SOAP-BARK, bark of *Quillaja saponaria* (see SOAPWORT). SOAP-BOILER, one whose trade is to make soap. SOAP-BOILING, the trade of making soap. SOAP-BUBBLE, a spherical film or air-bubble which floats in the air for a brief space, produced by blowing soapy water through a tube, as a tobacco-pipe. SOAP-ROOT (see SOAPWORT). SOAPSTONE, n. a soft variety of magnesian rock having a soapy feel (see STEATITE). SOAP-SUDS, water well impregnated with soap. SOFT-SOAP, a semi-fluid soap of a dirty brownish-yellow color, made with potash instead of soda.—*Soap* is a chemical compound resulting from union of fatty oils and fats with alkaline bodies.

According to Pliny, S. became known to the Romans by their conquest of Gaul. It is mentioned in the English version of the Bible; but it is believed that the words *borith* and *nether*, there rendered soap, really mean potash and soda.

The *chemical composition* of S. is as follows: The fixed fatty bodies, stearine, palmitine, and oleine, when heated with alkaline solutions, undergo the remarkable change *Saponification*, or conversion into S., during which process the fats yield a clear viscid liquid, which, from its sweetness, is termed *Glycerin* (q.v.). The nature of this change may be ascertained by decomposing the S. thus formed, which exists as a homogeneous transparent mass, freely soluble in warm water, by the addition of some acid, such as tartaric or hydrochloric, which combines with the alkali, and forms a soluble compound with it. A fatty matter separates in flakes, which melt on the application of heat, and form an oily layer on the surface of the fluid. This substance, when cold, is found to be very different from the original fat. It has acquired a strongly acid reaction, as may be ascertained by applying test-paper to it in its melted state, and it is freely soluble in alcohol, the solution being strongly acid. It at once forms a clear solution in hot alkaline liquids, while the original fat would under similar conditions have formed a milky-looking fluid. It is, in fact, a true *acid*, capable of forming salts, the potash and soda salts being known as *soft-soap* and *hard-soap*, which have been thus generated out of the elements of the

neutral fat under the influence of the alkali. Stearin (q.v.), when thus treated, yields *Stearic Acid;* palmitine yields *Palmitic Acid* (q.v.); and oleine, *Oleic Acid* (q.v.); while common fat, which is a mixture of the three above-named fats, affords, on saponification with an alkali, and subsequent decomposition of the S., a mixture of the three fatty acids.

The term S. is sometimes extended in meaning, to include compounds of the fatty acids with other bases besides the alkalies, e.g., lime, baryta, magnesia, etc.; but these compounds being insoluble are inapplicable to the purpose of cleaning. The true soaps owe their cleaning power to their solubility, and their attraction for the matters that ordinarily constitute 'dirtiness.' The presence of a portion of free alkali increases the detergent power, especially in the case of greasy matter.

Manufacture.—Hard-soap is made from tallow, palm-oil, olive-oil, cotton-seed-oil, bone grease, and kitchen fat, by boiling to saturation with caustic-soda. Cocoa, palm-nut, almond, sperm, and some other oils are occasionally used, chiefly in imitating superior soaps, and the only other ingredient of consequence is rosin, the residuum of the distillation of rough turpentine. In s. Europe, coarse olive-oil is the staple material, and from this are produced the marbled and white soaps known as 'Marseilles' or 'Castile.'

The S.-maker first dissolves in boiling water 6 to 8 cwt. of crude soda-ash (see SODA) in a cast-iron circular vessel (contents may be 1,000 gallons) furnished with a steam-pipe in its centre. He then adds half the weight of *pure caustic* lime, and boils the mixture. When the lime has rendered the soda caustic, the boiling is discontinued, subsidence takes place, and the lye is ready for use.

S.-pans are of various sizes. One of moderate dimensions may turn out six to eight tons, and is usually formed of four pieces of cast-iron—lower casting, about five ft. in diameter; upper, eleven. Heat is applied either by means of a furnace beneath the bottom piece, or by open steam introduced by a pipe led to a circular perforated ring at the bottom of the pan. Steam-boiling being now in general use, this description will apply to that method.

Curd or White Soap.—20 cwt. of tallow or other fat being put into the S.-pan, and a quantity of the prepared lye, steam is turned on, and boiling continued until the lye is thoroughly incorporated with the tallow and becomes a pasty mass. A measured quantity of common salt is now added, when the lye begins to separate. The partially formed S. is allowed to cool; and the salted lye, now deprived of its soda, subsides, and is drawn off from the bottom by a pipe, or removed by a pump. The operation of adding and boiling with lye is repeated until the tallow is saturated with soda and the lyes show as much alkali after boiling as before. The S. is now treated with weaker lye, and by more or less water brought to the consistency that the maker requires. From its tendency to thicken rapidly.

it is transferred to the frame at a higher temperature than the S. next described.

Pale or Yellow Soap.—When the tallow is saponified as above described, about ⅓ of its weight of rosin is added, and the boilings with lye repeated until the mass is thoroughly saponified. The practiced workman, being aware that perfect S. is insoluble in strong alkali, avoids the risk of imperfect particles escaping the action of the lye by their being enveloped in perfect S., by reducing the mass with water, and adding lye gradually until the S. again floats as a curd on the liquid. The S. is then cooled down, and the lye being removed as completely as possible, it is boiled with the quantity of water necessary to bring it to the consistency required. These later operations require much experience, and the best theoretical knowledge requires the aid of tongue and eye to carry them through with success. The S. being now *finished* (the technical term), the copper is covered up, and the contents allowed to settle until the temperature falls to about 160° F. According to the quantity of water used, so is the deposit, called the *nigre*, greater or less. When too much water is used, the produce of S. is too small; when too little, the produce is large, but of inferior quality, from insufficient deposit of impurities. This nigre is employed in making second-class S. When of proper temperature, the S. is removed into frames, now usually of cast-iron, containing about 10½ cwt. each, where, after solidifying, which it does in three days, it is cut by wire into slabs, which are again cut transversely into bars for the market.

Mottled Soap is made of kitchen fat (no rosin). The process described in the making of curd S. is followed, except that when perfect the S. is, when almost boiling, put into wooden frames three or four times as high as the ordinary frame of 52 inches, and the lye allowed to percolate through the soap to the lower part of the frame, producing the mottled appearance desired. As this S., when subjected to any mixing operation, lost its *mottle*, it long held high reputation as a genuine S.; but since cheap imitations, with a beautifully marbled appearance, are produced from cocoa and palm-nut oils with coloring and siliceous matter, its prestige is on the wane.

The numerous patents taken out for improvements in S.-making, have had the object more of cheapening, by addition of various articles to S. in its semi-fluid state, than of improving the manufacture.

Marine Soap, or *Salt-water S.*, is made of cocoa-nut oil and soda. Cocoa-nut oil does not form an emulsion with weak alkaline solutions; but with strong solutions it saponifies readily even without heat, and forms, without any separation of the under-lye, a firm S., notwithstanding the presence of considerable water. This S. is not insoluble in a strong solution of salt, hence it can be used for washing with sea-water: hence its name.

Soft-soap differs from hard in having potash for its base instead of soda. The repeated changes of lye described in the manufacture of hard-S. are here inadmissible, for all

the lye employed remains in combination with the oily materials, and is never separated. Hence open steam, as throwing in water into the mass, cannot be applied, nor can salt, so useful an agent in hard-soap manufacture, be used, as it would tend to separate the S. from the lye, while a thorough combination is essential. The making of soft-S. requires experience and nicety, it being so easy to overdo the supply of alkali, which cannot happen in hard-S. A ton of materials, consisting of 1,900 lbs. of fish or other oil, with 340 lbs. tallow, is put into the S.-pan with 200 gallons of American potash lye of such strength that 6,600 grains of real potash are in each gallon. After being boiled by the heat of a furnace, and well beaten down on the surface to keep in bounds the frothy mass, a stronger lye, containing about 8,700 grains of potash per gallon, is added at short intervals, and the boiling carried on until the workman ascertains by taste and appearance that the soap is perfect. The tallow serves to give consistency to the S., and also produces white specks of stearate of potash, which much enhance its appearance.

Toilet Soaps, for use in personal ablution, differ essentially from the kinds above described. But manufacturers of toilet soaps study to have them free from uncombined alkali, whose presence is injurious to the texture of the skin. Such soaps are also perfumed, tinted, and cast into convenient forms.

SOAP, Medical Uses of. The only kind of S. that should be used internally is *White Soda S.* It is prepared from caustic soda and either olive or almond oil. In its purest state it is called *Medicinal S.*, while in its less pure forms it is known as Alicant, Venice, Spanish, or Castile soap. When properly made, it should be perfectly soluble in pure water and in alcohol. It is employed chiefly to form pills of a gently aperient and antacid action. Pills containing a combination of S. and dried carbonate of soda are of great use in certain forms of gravel. S. is often added to pills as an adjuvant, or to prevent them from becoming hard and insoluble. White S. affords a ready antidote in cases of poisoning with the strong mineral acids.—*Soft S.* ought to be made with olive-oil and potash, and it should be of yellowish-white color, inodorous, and of the consistence of thick honey. It is of great service, as an external application, either alone or in association with sulphuret of potash, and other remedies, in various cutaneous affections.

SOAP'BERRY (*Sapindus saponaria*): West Indian tree, of nat. order *Sapindaceæ*, the pulp of whose fruit is used instead of soap in washing. This property belongs to other species of the same genus. Except *S. marginatus*, found in the southern states, the genus is entirely tropical. The use of the pulp as soap, if often repeated, is apt to injure linen; but it is capable of cleansing as much linen as 60 times its weight of soap. Each fruit contains a nut of shining black color. These nuts are very hard, and were formerly imported into Europe to be made into waistcoat buttons, being tipped with silver or other metal. They

were little liable to injury by wearing or to be broken. The *S. marginatus* is a small tree, with 8–20 lanceolate leaves on leaf-stalk often margined; the small white flowers in panicles produce large whitish berries.

SOAP-PLANT (*Chlorogalum pomeridianum*): Californian plant of the order *Liliaceæ*, the remarkable fibrous-coated bulb of which, stripped of its fibres, is an excellent substitute for soap, with the odor of new brown soap. The branching brownish stem, 1–3 ft. high, bears scattered bracts and flowers, with the narrow segments of the perianth marked by three colored nerves: the leaves are broadly linear, 6–18 in. long. Two other species on the Pacific coast, having probably the same detergent virtue, are *C. parviflorum* and *C. angustifolium*.

SOAP'-TEST: mode of determining the degree of hardness of water. Every one knows how much more readily a lather is formed—e.g., in washing the hands—with soft than with hard water. This is accounted for by the earthy bases (lime and magnesia) of the hard water displacing the alkaline bases of the soap, and forming, with the fatty acids, compounds insoluble in water. This is the foundation of the S.-T. A measured volume of the water is put in a bottle, and into this is dropped from a graduated vessel a standard solution of soap, till the mixture, by addition of the last drop of soap, has acquired the property of throwing up a creamy froth when shaken violently—thus showing that all the soap-destroying constituents have been precipitated. The volume of soap required is the measure of the hardness of the water. The soap solution is referred to a standard by means of water of a known degree of hardness prepared from a known weight of lime carbonate by converting it into neutral calcium chloride, dissolving this in water, and diluting to a certain volume. A water has 1, 2, 3, etc., degrees of hardness if, in soap-destroying power, it is equivalent to a solution of calcium carbonate containing 1, 2, 3, etc., grains of this salt per gallon.

SOAP'WORT (*Saponaria*): genus of plants of nat. order *Caryophyllaceæ*, having a cylindrical or ventricose 5-toothed calyx, without any outer calyx or attendant bracteæ, five undivided petals with long claws, ten stamens, two stigmas, and a capsule opening at the top by four valves. Some species have very beautiful flowers: *S. Calabrica* has become one of the most favorite annuals in flower-gardens.—COMMON S. (*S. officinalis*), often called Bouncing Bet, is 1–2 ft. high, has leaves 3–5-ribbed, and pale rose or white petals, notched at the end, most commonly double-flowered. It is found on waysides, in thickets, and on the banks of streams, in most parts of Europe. Both the root and the leaves contain Saponin (q.v.), so that they are sometimes used in washing. The brownish-red color of the bark, of the root, however, is apt to tinge white articles. The root of this plant has also medicinal properties, being aperient, resolvent, and alterative; and is sometimes sold as RED SOAP-ROOT.

Nearly allied to genus *Saponaria*, but having an angular calyx and a 5-valved capsule, is genus *Gypsophila*, some species of which are called SOAP-ROOT, and contain much saponin. Thus, the EGYPTIAN SOAP-ROOT (*G. struthium*), and the SPANISH SOAP-ROOT (*G. Hispanica*), called *Jabonera* in Spain, have been used in washing from time immemorial, and the roots, not having a dark rind, can be used for washing white articles, and are to some extent an article of commerce, being used for silken and other stuffs whose colors do not bear the application of soap. The roots of *Lychnis dioica*, a common Brit. plant, have the same properties in less degree.—The bark of *Quillaja saponaria*, Chilian tree of nat. order *Rosaceæ*, contains much saponin, is generally used for washing in Chili and Peru, and there forms a considerable article of commerce under the name Soap-bark.—Some tropical South Sea Islands produce a species of vine (*Vitis saponaria*), whose stem, especially the thicker part, cut into pieces, and softened by cooking on hot stones, produces in water a rich lather almost equal to that of soap. See also SOLANUM.

SOAR, v. *sōr* [F. *essorer*, to expose to the air, to mount or soar up—from L. *ex*, out; *aura*, air: It. *sorare*, to hover in the air like a hawk]: to mount up on the wing; to fly aloft; to rise high in thought or imagination; to be sublime, as the poet or orator; to be lofty generally: N. a lofty flight. SOAR'ING, imp.: ADJ. rising aloft: N. act of towering in thought or mind. SOARED, pp. *sōrd*. SOAR'INGLY, ad. *-lĭ*.

SOARANT, a. *sōr'ant:* word used in modern heraldry as a synonym of Volant (q.v.).

SOAVE, a. ad. *sō-â'vā*, or SOAVEMENTE, ad. *sō-â'vā-mĕn'tā* [It.—from L. *suavis*, sweet]: in *music*, sweet; with sweetness.

SOB, v. *sŏb* [an imitative word: AS. *seofian*, to lament: Ger. *seufzen*, to sigh]: to sigh with a sudden and convulsive heaving of the breast; to weep: N. a short convulsive sigh. SOB'BING, imp.: N. act of sighing with convulsive heavings of the breast; a modification of the ordinary movements of respiration excited by mental emotions. It is the consequence of a series of short convulsive contractions of the diaphragm, and is usually accompanied by closure of the glottis, preventing entrance of air into the lungs. SOBBED, pp. *sŏbd*.

SOBER, a. *sō'bĕr* [F. *sobre;* It. *sobrio;* L. *sobrĭus*, not drunk—from L. *so*, *se*, without; *ēbrĭus*, drunken]: temperate; not under the influence of strong drink; possessing habits of temperance; right in mind; not visionary or heated with passion; grave; serious: V. to free from intoxication; to become sober; to bring to a right frame of mind. SO'BERING, imp. SO'BERED, pp. *-bĕrd*. SO'BERLY, ad. *-bĕr-lĭ*. SO'BERNESS, n. *-nĕs*, freedom from intoxication; freedom from heat and passion; temperance. SOBRIETY, n. *sō-brī'ĕ-tĭ*, the state or quality of being habitually free from the influence of strong drink; habitual freedom from heat and passion; gravity; calmness. SOBER-MINDED, a. habitually calm and temperate. SOBER-MINDED-

NESS, n. the state of being free from inordinate passion; calmness.—SYN. of 'sober, a.': temperate; regular; calm; serious; solemn; grave; sedate; abstinent; abstemious; moderate; steady; cool; collected; dispassionate; unimpassioned; staid; sombre.

SOBIESKI, *so-bē-ĕs'kē*, JOHN: see JOHN III., King of Poland.

SOBOL, n. *sō'bŏl*, or SOBOLES, n. *sŏb'ō-lēz* [L. *sŏbŏlēs*, a sprout, a shoot]: in *bot.*, a creeping underground stem. SOB OLIF'EROUS, a. *-lĭf'ĕr-ŭs* [L. *fero*, I bear]: producing young plants from the roots.

SOBRAON, *sō-brâ-on'*: village on the left bank of the Sutlej, 25 m. e.n.e. of Ferozpur, near which, 1846, Feb. 10, was a most obstinate battle between the British army of 15,000 men, under Sir Hugh Gough, and a Sikh force of 30,000. The Sikhs were strongly intrenched, and made vigorous resistance; but their earthworks were captured in succession, and they were driven across the Sutlej, with a loss in killed, wounded, and drowned of 13,000. Gough immediately followed up his victory by crossing into the Punjab in pursuit of the fleeing enemy.

SOBRIQUET, n. *sō'brĭ-kā* or *sō'-* [F. *sobriquet*, a nickname: Norm. *bruchet*, the bole of the throat: the origin of *sobriquet* is seen in the Norm. phrase, *fouler sus l'bruchet*, to seize by the throat; *sobriquet* is thus properly a chuck under the chin, then a quip or cut given, an affront, hence a nickname]: a burlesque name; a nickname.

SOC, n. *sŏk*, or SOKE, n. *sōk* [AS. *soc*, liberty, franchise: Ger. *sache;* Dan. *sag*, matter, case, cause]: in *OE.*, the privilege granted by the king to a subject to administer justice and execute laws and jurisdiction; the territory in which such is exercised; a certain feudal tenure, lower than military and higher than predial service. SOC'MEN, n., or SOC'AGERS, or SOC'CAGERS, n. plu. *-ă-jĕrz*, tenants whose tenure is called *socage;* tenants of the crown or a lord who were freeholders: see SOCAGE.

SOCAGE, or SOCCAGE, n. *sŏk'kāj* [mid. L. *socāgĭum*, socage (see SOC)]: tenure of lands in England, of which the characteristic feature is, that the service is fixed and determinate in quality, thereby differing both from knight-service and from villeinage. It was originally peculiar to the Anglo-Danish districts of England. When the allodial tenure (see ALLODIUM—ALLODIAL TENURE) was converted into immediate dependence on the crown, this tenure seems to have arisen out of the necessity for commendation or seeking a lord. In Domesday, socmen are often mentioned as bound 'to seek a lord,' or free to go with their land where they pleased. The socmen of Stamford are said to be free to seek a lord, being only liable to the king for the toll attached to them as inhabitants of a borough. Three kinds of S. have been enumerated as existing at a later period—free and common S., S. in ancient tenure, and S. in base tenure. The second and third kind are equivalent to tenure in ancient demesne and copyhold tenure (see DEMESNE, ANCIENT: COPYHOLD), and the first kind is what

has generally and more properly been denominated S., where the services were both certain and honorable. Besides fealty, which the socager was bound to do when required, he was obliged to attend the court baron of his lord.

By an act passed during the Commonwealth, and confirmed under Charles II., tenure by knight-service was abolished, and all lands except copyholds and church-lands held in free alms were directed to be held in free and common socage, which is now (with those exceptions) the universal tenure of real property in England and Ireland. For Scotland, see MANRED (BONDS OF).

SOCIAL, a. *sō'shăl* [F. *social*—from L. *socĭālis*, social—from *socĭus*, a companion: It. *sociale*]: pertaining to men as living in society; ready to engage in friendly and familiar intercourse; companionable; disposed to mix in society; festive. SO'CIALLY, ad. *-lĭ*. SO'CIALNESS, n. *-nĕs*, or SO'CIAL'ITY, n. *-shĭ ăl'ĭ-tĭ*, quality of being social; fellowship. SO'CIABLE, a. *-shă-bl*, fit to be conjoined; disposed to mix in society in friendly intercourse; inclined to familiar and easy conversation in company; friendly; companionable: N. *familiarly*, a pleasant meeting or assembly; a kind of couch for two persons; a kind of carriage. SO'CIABLY, ad. *-blĭ*. SO'CIABLENESS, n. *-bl-nĕs*, or SO'CIABIL'ITY, n. *-shĭ-ă-bĭl'ĭ-tĭ*, disposition to associate in familiar intercourse. SO'CIALIZE, v. *-shăl-īz*, to render social; to reduce to a social condition. SO'CIALIZING, imp. SO'CIALIZED, pp. *-īzd*. SO'CIALISM, n. *-shăl-ĭzm*, that system which has for its object the reconstruction of society on the basis of a community of property, and association instead of competition in every branch of human industry—a theory held sometimes in alliance with communism (see below). SO'CIALIST, n. *-ĭst*, one who advocates the system of socialism. SO'CIALIS'TIC, a. *-ĭs'tĭk*, relating to or like socialism. SOCIAL EVIL, n. a term often applied to prostitution. SOCIAL HYMENOP'TERA, n. in *entom.*, term embracing those ants, bees, and wasps living in community. *Apis mellifica*, the hive-bee, is the best-known example. SOCIAL PLANTS, in *bot.*, such plants as grow naturally in groups or masses. SOCIAL SCIENCE (see below). SOCIAL WAR, name given to the war (B.C. 91) between the Romans and those of the Italian tribes who were specially termed the allies (Socii) of the Roman state, in which the latter fought for admission to the rights and privileges of Roman citizenship, which object they ultimately obtained. SO'CIATIVE, a. *-shĭ-ā-tĭv*, that may associate with.—SYN. of 'sociable, a.': friendly; social; familiar; companionable; conversable; accessible; communicative; convivial; festive.

SOCIALISM, *sō'shal-ĭzm*, from the latin *socius*, a comrade: seems to have been first used by an anonymous English writer in 1835 and applied to the utopian scheme of universal co-operation advocated by Robert Owen (q.v.). The usage of the word was rapidly broadened to include such other utopian schemes as those of the French philosophers Fourier (q.v.) and Saint Simon (q.v.), and, later, all utopian schemes based upon communistic principles from Plato's *Republic* onward.

To-day, however, the word is used in an entirely different sense and the Socialist movement has no connection with such schemes for universal regeneration as those named. The Socialist movement is a political one—sometimes, as in Germany, called Social-Democratic, a term first used by an Irish Chartist (see CHARTISM) leader, James Bronterre O'Brien. This political movement is based upon a theory of humany evolution and the word Socialism is used in a twofold sense as designating that philosophy on the one hand, and the ideal, the objective aimed at by the movement, on the other. To properly define Socialism, therefore, this distinction must be carefully observed.

The philosophical theory of Socialism may be thus briefly explained: Human society as at present constituted is the result of a long process of evolution from savagery. While many factors have entered into that evolutionary process to determine its direction and rate of development, the most important of all, the primary force, has been economic. The totality of economic conditions, including climate, fertility of the soil, the evolution of tools and machinery—in a word, all those circumstances which determine the production and exchange of material wealth.

Primitive man, before the origin of private property, lived for thousands of years in a state of Communism. Progress began with the division of labor and the rise of slavery, the first form in which private property appears. After thousands of years during which slavery was the prevailing social system, modifications appear as a result of new and improved methods of production and we have the serfdom of feudalism (q.v.). This system continued for centuries throughout Europe, until the rise of the manufacturing system and the development of the craft guilds (q.v.). In some parts of Europe, notably the Slavic countries, much of the old feudalism still remains, and the same is true of a large part of Asia.

With the invention of the steam engine and the power-loom the modern capitalist system may be said to have begun and the wage-labor system which is the principal objective point of the Socialist attack became almost universal. Under slavery the interest of the master was, obviously, different from that of the slave. The terms in which we speak of their relationships indicate a fundamental antagonism of interest. Under feudalism this

antagonism was modified in extent but retained in principle. While under slavery all the slave's product belonged to his master, under feudalism the serf worked part of his time for himself and family and for the lord of the manor the rest of the time. As the workshop system extended under the guilds, and the latter became more powerful than the feudal lords, the custom of free handicraftsmen co-operating in production for their mutual advantage gave place to a system of wages paid by the owners of factories and tools to the workers. Under this system, which, as stated, became general with the inventions which made the industrial revolution in England, the antagonism of interests appears between wage-payers and wage-receivers, each side striving for its own advantage. In this brief outline we have given the gist of the argument which is the root principle of modern Socialism as formulated by Karl Marx (q.v.) and Frederich Engels (q.v.) that 'all history has been a history of class struggles, contests between exploiting and exploited, ruling and oppressed classes.' The workers of to-day the proletariat, are exploited through the agency of wage-payments representing only a portion of the values created by their labor. The other portion representing the income of the capitalist class is called by Socialists 'surplus-value,' a term commonly supposed to have been invented by Karl Marx to connote the source of profits, but in reality invented by Bronterre O'Brien. Socialism is therefore primaryily a movement of the working-class—using that term in its widest connotation—to end this exploitation by securing a collective ownership and control of the principal agents of production and distribution by a democratic government, so that goods will be produced for use instead of for profit. Socialists claim, and a great many non-socialist writers agree, that the modern trust (q.v.) inevitably leads to Socialism.

Politically, Socialism may be said to date from 1863 when Ferdinand Lassalle (q.v.), brought about the organization of what is now known as the German Social Democratic Party. To-day, the movement is organized in almost every civilized country of the world. The German party is strongest. In 1903, the last year for which figures are available, it polled over 3,000,000 votes, being 30 per cent. of the total electorate. It has 81 members in the Reichstag. France has over a million Socialist voters and 75 Socialist members in the Chamber. Belgium has over 500,000 Socialist voters and 30 members in the Chamber. In the United States there were in 1904 over 400,000 Socialist voters who supported Eugene V. Debs, and while no members were elected to Congress by the party. Socialist representatives were elected to various state legislatures and many city councils. In England, Australia and New Zealand there are strong Labor Parties in parliament which are practi-

cally Socialist parties in everything but name. A careful tabulation of the vote cast for Socialism all over the world, using the last election in each case as a basis of reckoning, shows that there were 7,601,384 such votes cast, not including the scattering but significant votes in South Africa and Japan, but including 36,000 enrolled Socialists in Russia, which is probably a considerable under-estimate.

Allowing for differences in political conditions, there is very little difference between the programmes of the Socialist parties of the world. They all aim at the collective ownership of natural resources, such as mines, forests, and the like; of public utilities, such as railroads and waterways; and of all industries which have become largely centralized and subject to monopoly. No Socialist party anywhere aims at destroying private property or preventing private industry, so long as these do not involve the exploitation of the labor of others than the owners themselves. Social ownership and control in things socially essential and the restriction of private ownership and control within these limits is the programme of modern Socialism. Thus it differs radically from Communism (q.v.) on the one hand and Anarchism (q.v.) on the other.

The main criticism of Socialism has been based upon the assumption that it involves the destruction of personal liberty. The intellectual battleground has been the issue of Socialism versus Individualism. With the creation of the modern business corporation as an 'artificial individual,' that is to say, the conferring of the legal status of the individual upon organizations of capital, this issue tends to become obliterated and more and more the conflict assumes the nature of one upon the extent to which Socialism is acceptable, practically of Socialism versus Reform.

BIBLIOGRAPHY.—The principal phases of Socialism are well covered in the following works: HISTORICAL.—R. T. Ely's *French and German Socialism*, T. Kirkup's *History of Socialism*, and M. Hillquit's *History of Socialism in the United States*. PHILOSOPHY.—F. Engles' *Socialism, Utopian and Scientific;* Werner Sombart's *Socialism and the Social Movement in the XIXth Century*, and W. J. Ghent's *Mass and Class*. ECONOMICS.—K. Marx's *Capital*, and *Value, Price and Profit*, E. Vandervelde's *Collectivism*, and H. M. Hyndman's *Economics of Socialism*, are the best books in the English language. For the whole theory of Socialism, John Spargo's *Socialism: A Study and Interpretation of Socialist Principles* is the most satisfactory work yet produced. All these books are more or less pro-Socialistic. For criticisms of Socialism, E. Shaffle's *Quintessence of Socialism*, John Rae's *Contemporary Socialism*, Bohm Bawerk's *Karl Marx and the Close of His System*, and R. Flint's *Socialism*, are perhaps the most effective.

SOCIAL SCIENCE—SOCIAL SERVICE.

SO'CIAL SCI'ENCE: the science that deals with the social condition, the relations, and institutions which are involved in man's existence and his well-being as a member of an organized community. It concerns itself more especially with questions relating to public health, education, labor, punishment of crime, reformation of criminals, pauperism, and the like. It thus deals with the effect of existing social forces, and their result on the general well-being of the community, without directly discussing or expounding the theories or examining the problems of sociology, of which it may be considered as a branch (see SOCIOLOGY). A society called the 'National Association for the Promotion of Social Science' was organized in London, at a meeting under Lord Brougham's auspices, 1857, July, to consider the best means of uniting all those interested in social improvement. The annual meetings have been held each year at a different place. The association as now constituted comprises five sections—1. Jurisprudence and Amendment of the Law (subsection, Repression of Crime); 2. Education; 3. Health; 4. Economy and Trade; 5. Art. The 'American Social Science Association' was founded 1865, and holds annual meetings in different cities. Its objects are the same as those of the English National Association.

SOCIAL SERVICE: the modern study of people and conditions looking toward the betterment of mankind; a forward movement dealing with life, occupations and environments, embracing the observation and investigation of the relation between employers and employees, co-operation, labor legislation, hours of work, wages, industrial betterment, child labor, factory sanitation and inspection, safety appliances, improvement of civic and municipal conditions, civil service, public ownership, the initiative and referendum, tax reform, marriage and divorce, housing, temperance, pauperism and crime, defective and delinquent children, education, social settlements, institutional churches and the like.

The necessity for systematized social service was impressed originally upon the minds of Englishmen, due to the enormous increase in the outclass class in London and other large cities of Great Britain. It was realized that useful aid along a variety of lines could be best given by men and women actually living among the poor and studying the difficulties besetting them. The aid intelligently extended through this system hastened the regenerative process. The work pursued assumed three general forms: 1. Relief through charity and medical attendance; 2. the providing of opportunities of a social and recreative character; 3. the establishment of educational centers for purposes of primary or advanced instruction, including certain phases of culture. In 1860 F. D. Morris established the Workingman's College in London. In 1867 Cambridge University started its first University Extension scheme. Following this, in 1869

the Charity Organization Society was founded, and in 1873 John Ruskin and some associates discussed the idea of social service through settlements. In 1885 Toynbee Hall was opened in East London, and in 1887 the Neighborhood Guild, now named the University Settlement, was opened in the United States in New York City. These initiatory steps have been followed by others of a closely allied character in all large cities where the density of population is sufficient to indicate the need for social service.

The dominant idea in settlement work is that of teaching wage-earners to help themselves. The goal sought is individual development, stimulated into being under the guidance of teachers. The element to be eliminated in all these efforts is that of patronage. Social service in the nature of direct gifts of food, fuel, clothing or money must be extended with great discrimination, lest chronic pauperism be encouraged, and the already too large class of parasites on the charitable world be increased. In all phases of the work, tact and judgment are required, but these are particularly requisite in dealing with those cases where pride prevents an advertisement of need, or forbids the acceptance of unsolicited help. Persons possessed of these qualities, and who are capable of advising and preventing the development of acute conditions in particular cases, are of the greatest value in this kind of work.

Nature of the Work.—The work at a center is laid out into six classes: 1. Care of infants; 2. courses for children from six to fourteen years of age; 3. a course for boys and girls between fourteen and eighteen years; 4. a course for women of more than eighteen years; 5. a course for men eighteen and upwards, and 6. general courses of an advanced nature. In connection with talks to mothers, ocular demonstrations of the best care of infants and young children are given. Children fit for kindergarten work receive the benefit of æsthetic culture through colored paper work, music, songs, parties, games, plays, etc. The older children of from six to fourteen, through physical culture classes, are given opportunities for improving their general health; they are formed into clubs for the purpose of developing administrative ideals, and encouraging self-help. Their work consists of drawing, sewing, mending, wood-carving, cooking, nature study, musical classes, chorus work, including entertainments, art exhibits, summer day outings, picnics and winter socials and receptions. A late development is the teaching of dancing, which is found to be a most admirable means for the development of grace of body and the power of acting in concert. Those of eighteen years and upward follow a scheme which includes the preservation of health, study and training along technical lines, forms of instruction in classes, lectures, concerts, and various aids to culture, sociability and political breadth of mind. The idea running current through all these

courses, designed as they are to meet the requirements of the child, the youth and the adult, is that of inculcating the value of physical health, wage-earning and other concomitants of economic welfare, general instruction, an insight into the meaning of æsthetic culture, the value of functions which increase sociability, the advantages of clubs and discussions for the purpose of gaining political co-operation, and other means of creating a sense of 'community interest.'

Social Service to the Emigrant.—While in the older nations the class among which these activities are exercised is made up of natives, the 'submerged tenth' of London for instance; in America, it is the newcomer, the first generation of the emigrant herd and its children, that call for the labor of the social service workers, and the work required is the adjustment of the lives of these people to their new environment, and especially in giving to the older ones a sense of nationality and citizenship and a knowledge of the power this gives them. When they fully realize that they can, if they will, choose representatives to properly present their needs, an immense gain is made, and the feeling of class against class, and a belief in dominance of wealth in the government, ideas that are too prevalent, will be in a fair way of disappearing. To awaken within the emigrant a consciousness of his power is a moral, as well as an economic necessity, for social demoralization is really associated with healthy mental activity.

The religious question is delicate only when misunderstandings arise; if the expressed object of a center is to impart religious or ethical principles, a frank acknowledgment is proper. Some settlements operate along definite creed lines, so that no misapprehension arises even when proselyting results. Ambiguity in this respect is an injury to the cause.

The Administration of Settlements.—A head-worker is the chief of a staff of assistants which are divided into two classes; the first and most important class are the resident workers. The second class are called non-resident workers. The head-worker's duty is that of giving intelligent advice to his assistants, when they are in doubt as to what course to pursue. The workers in all cases are allowed considerable latitude as to ways and means of obtaining practical results, but no effort must be spared to avoid friction and to produce an absolute harmony in all parts of the machinery.

For the proper administration of activities centered in a settlement, money must be forthcoming; though the city itself is the direct benefactor, it is never the main contributor. The workers must be sufficiently well paid to enable them to live decently while devoting their time to the work. To the non-resident workers, no remuneration is given. It is then a necessary part of the work to secure money when there is not a regular income provided by endowment or contributions. As far as possible

the idea of self-support is advanced in all phases of settlement work. The head-worker and his assistants plan along economic as well as cultural lines. A head-worker of strong personality and broad mentality with experience and judgment is necessary as a supervisor and manager. Diplomacy is a great requisite, particularly in the encouragement of those willing to sacrifice time and labor for humanity's sake, as resident or non-resident workers.

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SO'CIAL WAR, in Roman History: the war of the Roman people with their allies among the states of central and s. Italy, who, having been allies (*Socii,* hence *bellum sociale,* 'war with the allies') of Rome, rose in revolt B.C. 91, and proposed the formation of a new Italian state. The leaders in the revolt were the Marsi (hence the Social war was called also the Marsian war), the Peligni, the Samnites, the Lucanians, and the Sabellians. The Social war lasted 3 years; and only by wise and liberal concessions to the Latin states was their confederacy weakened, and the authority of Rome reasserted. By the *lex Julia* (B.C. 90), the Roman franchise was offered to such of the Socii as had not revolted; by the *lex Plautia Papiria* (B.C. 89), any citizen of an allied state in revolt could obtain the franchise by giving his name to a pretor in Rome within 60 days; by the *lex Calpurnia,* Roman magistrates in the field were empowered to bestow the franchise on all who were willing to receive it. By these measures of concession and redress of grievances, the Italian confederation was by the end of A.D. 89 reduced to two peoples—the Samnites and the Lucanians—and their strength was broken by Sulla's brilliant campaign in Samnium.

SOCI'ETIES: associations of individuals for promotion of some particular object. Such objects are numerous, including the promotion and investigation of almost every well-recognized branch of science, art, and literature; the diffusion of knowledge, religion, and morality; intercourse between those of the same profession or trade; removal of legal grievances; mutual aid in case of distress; and other aims beneficial to the general public or to the members of the society alone. Those S. whose objects are scientific or literary are occasionally called *Academies* (q.v.), and under this or their own special names are notices of the chief societies at present existing.

SOCIETY, n. *sō-sī'ĕ-tĭ* [F. *société*—from L. *sociĕtas* or *sociĕtātem*, society—from *socĭus*, a partner, a companion]: a number of persons associated for a particular purpose (see SOCIETIES: ETC.: also ACADEMY): followship: the civilized body of mankind; the public: those persons in any community who usually associate together: a religious body, as a missionary *society:* the class whose members whether titled or untitled take the highest social position; in *OE.*, company; converse.

SOCI'ETY ISLANDS: small archipelago in the s. Pacific Ocean; lat. 16°—18° s., long. 148°—155° w.; comprising islands all now French possessions. There are 13 main islands—Tahiti (q.v.) or Otaheite, Maitia, Eimeo, Maiaoiti, Tetuaroa, Otaha, Moorea, Tuba, Lord Howe's Island, Scilly Island, Huahine, Raiatea, and Borabora; 1,411 sq. m. The cap. of Tahiti is Papiete (pop. 4,300). The chief agricultural enterprise in Tahiti is an estate of 10,000 acres in the hands of an English company. The islands closely resemble each other in appearance. They are mountainous in the interior—some summits rising 6,000 to 8,000 ft.; with tracts of low-lying and extraordinarily fertile land occupying the shores all round from the base of the mountains to the sea. They are surrounded by coral reefs, are abundantly watered by streams, and have a temperate and agreeable climate. Almost every tropical vegetable and fruit known is grown here; but agriculture is backward. The animals are those usually found in the South Sea Islands. The inhabitants belong to the Malay race; are affable, ingenious, and hospitable, but volatile and sensual. The practice of tattooing has almost disappeared, and the native costume now closely resembles that of civilized nations. There are now no native manufactures, these having been entirely superseded by imported goods. Cocoa-nut oil, oranges, lime-juice, arrow-root, kauri shells and pearl shells are the principal exports; and cocoa-nuts are the general article of barter throughout the islands for calicoes, cotton cloth, knives cordage, groceries, etc., imported chiefly from Tahiti. In 1901 the imports amounted to about $879,318.04; the exports to $736,174.78.

Tahiti is said to have been visited as early as 1606 by Quiros. Captain Cook reached it 1769, and discovered many of the other islands of the archipelago, to which he gave the name S. I., in honor of the Royal Soc. of

London. In 1797 the first mission-ship fitted out by the newly formed London Missionary Soc. arrived at Tahiti. After 19 years of apparently fruitless labor, the influence of the missionaries began to be felt, and soon afterward became so powerful as to be almost paramount. A quarrel between the Prot. and the Rom. Cath. missionaries who thought it better to enter on ground already occupied by Protestants, than to take up new ground for themselves, occasioned interference by France in favor of the Rom. Catholics, and the island of Tahiti was taken possession of in the name of Louis Philippe, by a strong French force, 1844. All the possessions of the native ruler were afterward placed under the protection of France; and by a treaty concluded 1880, Tahiti and its dependencies (particularly Moorea, Tetuaroa, and Raiatea) became French possessions. Many of the Prot. missionaries left the island in consequence of the interference of the French authorities with their labors. Some, however, remained, and the congregations continued to meet. An application to the Brit. govt. procured a concession on the part of the French govt. of some of the rights of religious liberty, which had been taken away by the local authorities.—King Pomare V. died 1891, June 15; and, according to the treaty, royalty then ceased to exist, and the annexation to France was complete.—Pop. (about) 10,300.

SOCIETY OF SAINT VINCENT DE PAUL, a Roman Catholic charitable organization, founded in May 1833, in Paris, by Frederick Ozanam (q.v.) and seven companions. At their first meeting the object of the society was outlined and expressed in the few words: 'Our work shall be for the service of God in the persons of the poor, whom we are to visit at their own dwellings and assist by every means in our power.' Frederick Ozanam is considered the founder as he was the first one who suggested the work. From a membership of eight in a small room in Paris, in 1833, the society has grown to a membership of thousands with local organizations in nearly all parts of the world. The members are men from all stations in life. There are numerous auxiliary societies, composed of women, who assist in the regular work of the Saint Vincent de Paul societies. The report of the secretary of the Superior Council of New York, for the year 1906, gives the total number of Saint Vincent de Paul conferences throughout the world as over 6,000; active members, about 700,000; honorary members, over 100,000.

SOCINIAN, n. *sō-sĭn'ĭ-ăn* [from Lælius and Faustus *Socinus*, founders of the sect in the 16th c.]: follower of Lælius and Faustus Socinus, who taught that Jesus Christ was a mere man, and who denied the Trinity.

SOCINUS, *sō-sī'nŭs*, FAUSTUS (It. FAUSTO PAOLO SOZZINI, *fows'to pâ'o-lo sōt-sē'nē*, so spelled by himself): Unitarian theologian: 1539, Dec. 5—1604, Mar. 4; b. Siena, Tuscany; nephew of Lælius S. (q.v.). By the mother's side, he was very highly connected; but having lost his parents while young, his education was carelessly conducted; and he himself lamented the imperfection of his scholastic culture. His lack of learning, however, only induced him to speculate more freely; thus it happened, partly from native bias, partly from the influence of his gifted uncle, that S. was an anti-Trinitarian before he was 22 years old. In 1559, when only 20 years of age, being charged with Lutheranism, he found it advisable to seek asylum in France, and was living at Lyon when he heard of his uncle's death. He immediately went to Zürich, and possessed himself of his uncle's MSS., after which he returned to Italy, and 1563 again conformed to the Rom. Cath. Church, and entered the service of Isabella de' Medici. Amid the cares of office and the dissipations of a court, he seemed to forget the thorny questions of theology. But at the end of 12 years he was seized with desire to investigate the truths of religion; and in spite of all remonstrances from Rom. Cath. friends, proceeded to Germany—the centre of theological activity. In 1574 he retired to Basel, to prosecute his studies more closely; but a disputation which he had with a certain Fr. Pucci (1578) made it necessary for him to leave Switzerland. At the request of George Biandrata, he visited Transylvania, where anti-Trinitarians were numerous, especially among the nobles—the bishop Francis Dávid tending to the denial of any (even though only nominal) divine honor to Christ. S.'s scheme permitted seeming acceptance of the doctrine of the church by using the terms of the creed in a new and rational sense: Christ was even to be addressed as God, with the understanding that he was a subordinate God into whose hands the only Supreme God had given for a time the government of this world. S. spent months in Dávid's house, eloquently urging this view. The effect on the bishop, who seems to have been a man pure in motive, positive in conviction, and straightforward in utterance, was to call forth his public refusal of any form of worship or invocation of Christ as God; of which innovation his political enemies took advantage, and he died in prison. S.(1579) went to Poland before Bp. Dávid's trial; and there eagerly sought (not without success) to make converts to his peculiar views. Anti-Trinitarianism was even stronger in Poland than in Transylvania, and there he preached and disputed and wrote with a zeal that Socinianism has seldom displayed since. His influence ultimately became controlling in that country. His position in relation to the Reformers was, that Luther and Calvin had rendered great services to religion, but that they had not gone far enough; that the only solid basis on which Protestantism could rest was human 'reason;' that everything that contradicted reason should be rejected as false and incredible; and that dogmas that were absurd

should not be allowed to shelter themselves from criticism because their defenders chose to call them 'mysteries.' The Protestants in Poland were alarmed, and their leaders undertook publicly to confute Socinus. A disputation in the college of Posna ended in Socinus reducing his opponents to silence, but they retaliated (after the fashion of the times) by raising against him a charge of sedition, which, though groundless, made it necessary for Socinus to withdraw from Cracow. While in retirement on the state of a Polish noble, Christopher Morsztyn, he married the daughter of his protector: she seems to have been a tender and affectionate wife; and her death 1587 almost broke his heart. About this period, his property in Italy was confiscated by the Inquisition, but his powerful and wealthy friends in Poland were generous to him in his needs. In 1588 he took part in the synod of Brest (on the borders of Lithuania), and combated all the principal dogmas of the church—the divinity of Christ (as also the Arian theory of Christ's pre-existence), propitiatory sacrifice, original sin, human depravity, and justification by faith. In 1598, on the publication of his *De Jesu Christo Servatore*, his enemies stirred up the populace of Cracow against him; and Socinus was pulled from a sick-bed, and nearly murdered. Soon afterward he found refuge with a friend in the village of Luclavie, where he died.—Socinus's works are no longer read; but his opinions have never lacked advocates in any Protestant country. He and his uncle were precursors of that spirit of rationalism which has so widely manifested itself in modern thought.—See Przipcow's Life of Socinus, prefixed to a collection of his works in *Bib. Frat. Polonorum* (Amst. 1656): this, which presents one view of Socinus, is the foundation of Bayle's article in *Dictionnaire*, and Toulmin's *Memoirs of the Life, Character, etc., of F. S.* (Lond. 1777): but see his letters, published and unpublished, which freely reveal his character. His theological system is best traced in the *Racovian Catechism* (q.v.).

SOCI'NUS, LÆLIUS (It. LELIO FRANCESCO MARIA SOZINI, *lā'lĭ-o frân-chĕs'ko mâ-rē'â sō-tsē'nē*): the elder of two celebrated theological controvertists—uncle and nephew—who have given name to a sect of Christians, the Socinians, one of the various divisions of Unitarians (q.v.): 1525, Jan. 29—1562, May 14; b. Siena, Tuscany; of a family distinguished in literature and science. After some legal training, he turned to theological investigation, ultimately resulting in his dissent from the standard dogma of the church as to the basis of salvation, as to predestination, as to the resurrection, and as to the sacraments, with serious questioning of the doctrine of the Trinity. He traveled in France, England, Holland, Germany, and Poland, making the acquaintance of many scholars, and finally settled in Zürich, where he died. Socinus seems to have had great genuineness of char-

acter, and a charming spirit. He was prudent and reticent in speech; but in his correspondence with his Italian relatives and friends, he showed himself an ardent and able disputant, and made not a few proselytes. His intellectual tendencies were toward mysticism and theological subtlety, his religious feeling was spiritually deep and enthusiastic. Calvin and Melanchthon were his friends—the former criticising his over-speculative tendency, but commending him by letter when he visited the courts of Vienna and Cracow; and Melanchthon giving him similar introduction to Maximilian II. 1558. Socinus sought rather for spiritual truth than to be the founder of a sect, though doubtless he greatly influenced the thinking of his nephew, Faustus.—See Illgen's *Vita Lælii Socini* (Leip. 1814), and *Symbolæ ad Vitam et Doctrinam Lælii Socini* (Leip. 1826); also Trechsel's work.

SOCIOL'OGY (Lat. *socius,* companion, whence *societas,* and Gr. logos), etymologically 'the science of society or association,' first coined by Auguste Comte in 1839, and given wide currency by Herbert Spencer since 1860, is still in process of getting a precise definition. It is used in four senses: (1) As a vague general term to include all knowledge and speculation about the associative life of men, and even to describe social facts themselves. This use, especially of the adjective form sociological, for social, or societary, is to be deprecated as slipshod and confusing. (2) Sociology is often made synonymous with social philosophy to describe either a general theory, for example, individualism or socialism, or a special interpretation of historical facts in a philosophy of history. The use of the word has certain validity because of the complexity of social facts and the difficulty of formulating rigid scientific laws. (3) Sociology seeks recognition as a science, classifying social facts, and discovering the laws which underlie association as such. To the word sociology in this third sense certain scholars would prefix 'pure' and others 'theoretical' or 'general,' to emphasize one aspect of the strictly scientific ideal. (4) Sociology also describes the scientific treatment of the problems of social organization and welfare. This 'practical' sociology is not an isolated science or art, but is organically related to 'general' sociology, as with many German economists, 'practical' economics is related to 'general' economics.

Speculation about social life and institutions may be traced to remote times until it is lost in the uncertain shadows of antiquity.

The Greeks.—Plato analyzed clearly the economy of division of labor, showed a keen insight into the nature and influence of public opinion, described vividly the processes of social degeneration, and pointed out the effect of conscious, concerted action in molding society. He emphasized the possibilities of education in relation to stability and progress and exalted reason as the source

of power and permanence. Throughout his discussions, Plato assumes and often asserts law, that is, a uniform and constant behavior of phenomena, as underlying all social facts and relations. Human conduct is conceived and represented not as capricious but as caused. Aristotle displayed an even keener scientific spirit in dealing with social life. His dicta: 'Man is naturally (instinctively) a political (social) animal,' and 'The state (society) is founded that men may live, but continued that they may live happily,' have an almost modern ring. Aristotle was a realist. He noted the effect of soil and climate on social life; he compared more than one hundred and fifty forms of government and emphasized the principle that human institutions are to be judged not absolutely but in relation to the conditions natural and social under which they grow. He outlined a theory of political revolutions which influences thought to this day. He saw clearly the dominance of law (in the scientific sense) in human affairs.

The Romans added little to social theory save in the formulation of legal principles and especially in the creation of the idea of a 'law of nature'—a body of principles common to all peoples and thought of as growing up spontaneously in a state of nature.

Scholasticism.—During the mediæval period all science and philosophy were closely related to theology. Questions bearing upon society were usually treated in conjunction with philosophical and theological science. The social theories then in vogue followed, in the main, the lines laid down by Aristotle, and for the most part were formulated in the scholastic commentaries on Aristotle and in treatises on common law and moral theology. The simplicity of social relations during this period and the want of historical or geographical knowledge of other societies failed to suggest a separate and distinct science upon social problems as understood in modern times.

The Break with Tradition.—But with the Renaissance social philosophy shared in the general division of thought. Sir Thomas More (1478-1537), through the literary device of his *Utopia,* made notable contributions to the theory of social causation as illustrated by poverty, crime, and punishment, and showed a shrewd knowledge of the force which public opinion exerts upon the members of a group. In a wholly different work, *The Prince,* Niccolo Macchiavelli (1469-1527) set forth the policies, all based upon the assumption of uniformities in human conduct, which a prince must pursue if he is to gain and maintain sovereignty. More important still was the subtle attack of Thomas Hobbes (1588-1679) on the 'divine right of kings.' In his *Leviathan,* Hobbes traced the royal power to an original agreement or consent among men that in order to put an end to strife and to preserve peace supreme power should be vested in one man and by him transmitted to his descendants. Hobbes' hypothesis, revolutionary in theory only, was

elaborated by John Locke (1632-1704) in his *Two Treatises of Government,* into a contract theory which based the royal power on the consent of the governed. While these speculations seem at first narrowly political, they really undermined the whole social philosophy of the age.

The *Social Contract* of Rousseau marked the climax of sociological discussion; his object of attack was the theological theory of society. He reflects in his work the influence of Hobbes, Locke and a group of French writers known as Physiocrats, who advocated the rule of law in social life, not as an influence of Diety, but as of nature. Rousseau's 'back to nature,' and his praise of the 'simple life,' are directly traceable to this influence.

A study of the writings of Vico (1668-1744) Montesquieu, Adam Smith and Malthus are all essential to an adequate understanding of the history of sociology, but the clearest exposition of the subject is to be found in the works of August Compte, whose life covered the first half of the 19th c., who coined the word itself, and who is often called the 'father of sociology.' The key of his system is in the phrase, 'Authority must come from agreement, not agreement from authority.' He attributed all social ills to mental chaos due to the survival of theological and metaphysical philosophizing. With the final triumph of positive or scientific method all men would have to agree not by external compulsion but by the inevitable logic of exact thought. Thus disagreement would disappear and harmony and solidarity be achieved.

The limits of our space will not admit of an extended discussion of all the modern theorizers whose labors have contributed to the development of the science, and who for the most part turned over the old material, until Herbert Spencer published his *First Principles,* in which he applied to the growth and development of human society, the law of evolution; the key of Spencer's system is found in the term 'the social organism,' which implies the analogy associated with his name. Spencer's terminology has become so universal that many even of those who attack his theories employ the phrases he originated. Thus integrate, differentiate, homogeneous, heterogeneous, 'survival of the fittest,' 'the struggle for existence,' all bear Spencer's stamp.

A large part of modern discussion and study of sociology has been the criticism or elaborations of Spencer's analogy. With many students the defense and extension of this analogy has seemed more important than the end it should serve, namely, a clearer insight into the nature of society. In the most recent study of the subject, the present tendency is away from general analogies to a close study of society as reflected in the conscious life of the social person. This new school questions many of the older conceptions of individuality, freedom, responsibility, originality, etc., and offers new theories of the person and his relation to society.

Sociology as Science.—It cannot be said that sociology has yet attained full recognition as a science, although in its name much genuine scientific work has been done. Many of the systems put forth by sociologists belong in the class with the philosophies of history mentioned above. Others, however, closely approach a scientific status and warrant inclusion under this head. Science by its very nature demands an adequate basis of facts. The materials available for the sociologist are from three chief sources: (1) The life and institutions of primitive or savage peoples have been studied and interpreted by a large number of ethnologists, anthropologists, and other scholars of whom the most prominent are Maine, Morgan, Tylor, Letourneau, McLennan, Westermarck, Brinton, Waitz, Ploss, Ratzel, Bachofen and Quatrefages. These men have set forth the nature of primitive society in a way which has thrown light upon all the problems of later and more complex civilizations. In these materials and reasoned conclusions the sociologists find an indispensable basis for their work. (2) Again critical historians like Niebuhr, Ranke, Mommsen, Stubbs, Gardiner and their followers have re-examined and re-interpreted historical sources so that a vast store of verified fact and scholarly reasoning is at the service of the student of society. (3) Contemporary social conditions are being studied by hundreds of specialists in economics, political science, demography, penology, etc. Statistics of the highest value are being gathered by government and private agencies. All the facts are available for a scientific sociology.

SOCK, n. *sŏk* [F. *soc;* Gael. *soc,* a plowshare]: in *Scot.*, the share of the plow.

SOCK, n. *sŏk* [F. *socque,* a sock—from L. *soccus,* a kind of shoe worn by comic actors: Icel. *sockr;* It. *socco;* Sp. *zoco,* a wooden shoe]: a covering for the feet; a kind of half-stocking; the shoe of the anc. comic actors—hence, comedy. SOCK'LESS, a. *-lĕs,* without a sock.

SOCK, v. *sŏk* [Gael. *soc,* a beak, a snout]: in *slang,* to knock a man's hat over his eyes and nose by a smart blow. SOCK'ING, imp. SOCKED, pp. *sŏkt.*

SOCK, n. *sŏk* [Ger. *saugen,* to suck: Gael. *sògh,* a dainty, a luxury]: in *OE.* and *slang,* a feast; a treat; a dainty.

SOCKET, n. *sŏk'ĕt* [dim. of SOCK 2, the original sense being evidently a small wooden shoe': Lat. *zocco;* F. *souche,* a stock or stump of a tree: F. *souchet,* a little stock or stump; *socle,* the base of a pedestal: It. *zoccolo,* a plinth, a wooden shoe]: the hollow base upon which a candle is fixed, like a tree upon its stump; any small hollow to receive and hold something; the receptacle of the eye. SOCLE, n. *sō'kl* or *sŏk'l,* in *arch.*, a plain, square, flat member used instead of a pedestal to support a column, a statue, etc.; a plinth or plain face at the foot of

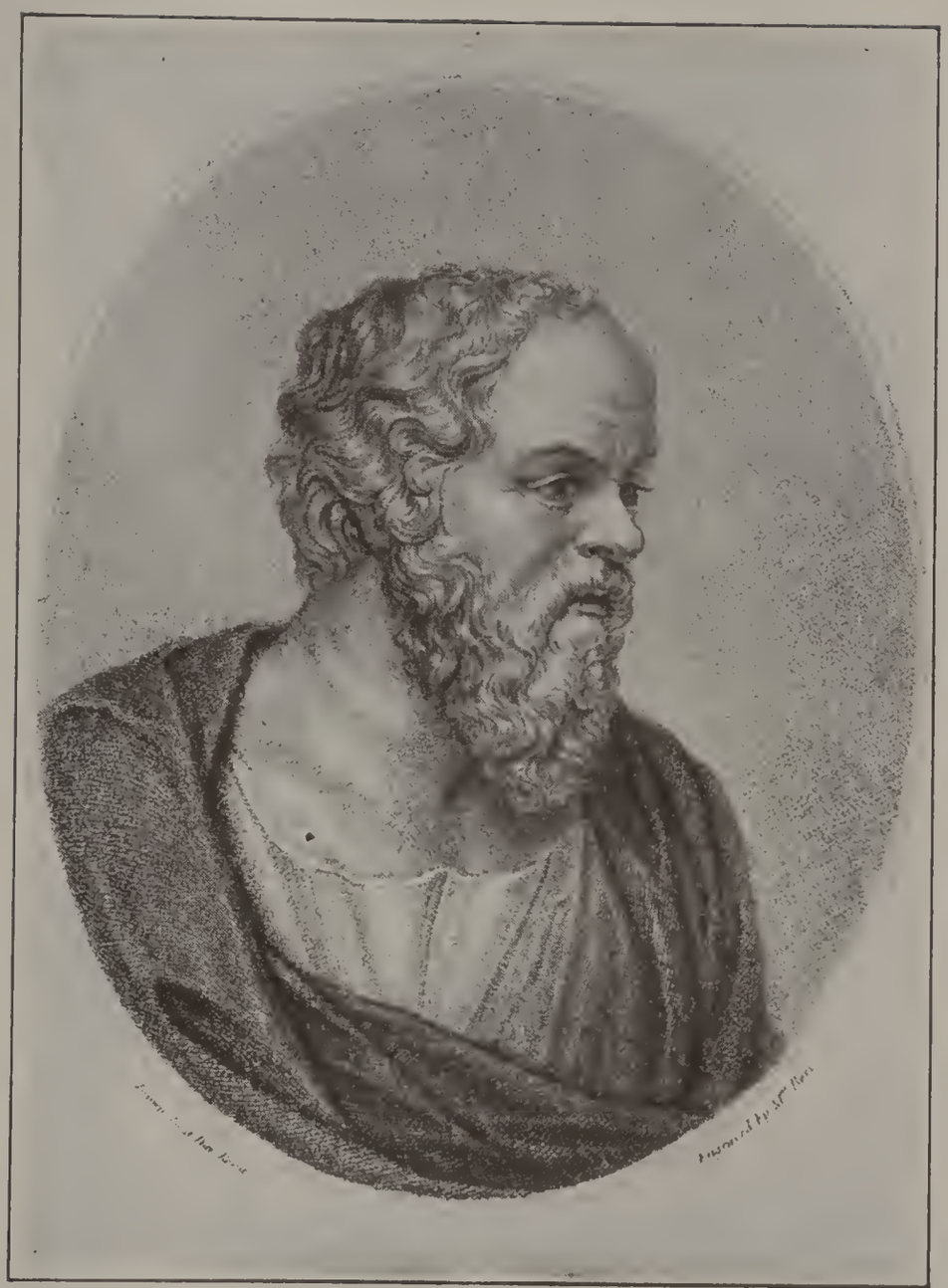
a wall. SOCKET-CHISEL, a strong chisel used by carpenters in mortising. BALL AND SOCKET, a socket with a knob or ball moving in it, forming a joint, which moves freely in any direction. SOCKET OF INCANDESCENT LAMP, the holder into which an incandescent lamp screws or attaches and which contains the ends of electric supply wires, for supplying current to the lamp.

SOCLE. See under SOCKET.

SOCORRO, *sō-kŏr'rō:* city, capital of Socorro co., N. Mex.; on the Rio Grande river and on the Atchison, Topeka & Santa Fé railroad; 5,000 ft. above sea-level. It was at this place that Cortes met his caravan on its way from old Mexico, with supplies and ammunition, when he and his army had been driven out of Santa Fé by the Indians, and were suffering for food and ammunition. The opportune relief led him to name the place Camp Succor. Franciscan fathers followed Cortes, established missions here and in the vicinity, and founded the cathedral of San Miguel, in which services are still held. Silver was discovered by the early Spaniards, who forced the Indians to mine for them and shipped the bullion to Spain, till the Indians revolted, massacred the Spaniards, and concealed the mines. The rediscovery of these old mines, and the working of them by experienced miners and modern machinery, have greatly enriched the town and territory. Socorro has an incorporated bank, several churches and public schools, and one weekly newspaper. Pop. (1900) 1,512; (1910) 1,226.

SOCOTRA, *sŏ-kō'trâ,* or SOCOTŌRA, *sŏk-ŏ-tō'râ:* island near the entrance to the Gulf of Aden, 71 m. long and at its widest part 22 m. broad. The interior is mountainous, but a plain 2 to 4 m. wide skirts the greater part of the coast. The scenery of the island is impressive; there are many fertile valleys, but the soil is little cultivated, the inhabitants living mostly on their flocks of sheep and goats and the natural products of the soil. The climate is hot and dry, the dry season lasting from May until October. During the dry season there is practically no rain in the lower section of the island and many of the rivers are entirely dried up. There is a great variety of flora which abounds in many aromatic species, such as dragon's blood, aloe, myrrh, frankincense, etc. The chief products of the island are butter and incense, which are exported to Zanzibar, Arabia and Bombay. The aloes of Socotra is esteemed the best in the world. The island was formally annexed to the British empire 1886. The inhabitants of the upland are a peculiar race, well built, with good features; those of the coast region are of mixed African, Arab, and other blood. Pop. about 10,000.

SOCOTRINE, n. *sō'kō-trĭn:* a native or inhabitant of *Socotra,* an island on the e. coast of Africa: ADJ. of or from *Socotra.*



SOCRATES.

SOCRATES, *sŏk'ra-tēz:* celebrated Greek philosopher: about B.C. 470—B.C. 399; b. Athens. His father, Sophroniskos, was a sculptor; and Socrates followed the same profession in his early life. His mother, Phænarete, was a midwife, to which avocation he was wont to compare his own peculiar method of conversational teaching. His family was respectable in descent, but humble in possessions. His physical constitution was robust to an extraordinary degree, enabling him to endure the hardest military service, and to live his own chosen life of superiority to all wants above the barest necessaries of life. While his ordinary diet was simple and abstemious, he could, at religious festivals or on social occasions, drink more wine than any one else without being intoxicated. He had the usual education of an Athenian citizen, which included not only a knowledge of the mother-tongue and readings in the Greek poets, but also the elements of arithmetic, geometry, and astronomy as then known. As a young man, he frequented the society of the physical philosopher Archelaus (disciple of Anaxagoras); but the philosophers who did most to determine his turn of mind must have been Parmenides and Zeno.

Except in connection with his philosophical career, few facts of his life are known. He served as a hoplite, or heavy-armed foot-soldier, at the siege of Potidæa, at the battle of Delium, and at Amphipolis; and his bravery and endurance were greatly extolled. On two memorable occasions, he stood forward in political life. After the battle of Arginusæ, 406, the ten generals in command were publicly arraigned for neglecting to obtain the bodies of the killed to receive the rites of interment. The clamor for their condemnation was so great that the court wished to proceed in violation of the legal forms; but Socrates, as presiding judge, firmly refused to put the question. The other occasion was during the tyranny of the Thirty, who took up the policy of compelling a number of influential citizens to take part in their illegal murders and confiscations; but Socrates withstood them at the peril of his own life.—Socrates was notable for his sincere and deep piety: it is recorded that he did nothing without taking counsel of the gods. He was regular in prayer; but, as only the gods could know what was best for man, he besought them not for particular good things, but for that which was 'the best.'

About the middle period of his life, he began the career that made him famous. Deservedly styled a philosopher, he neither secluded himself for study, nor opened a school for regular instruction of pupils. He disclaimed the appellation of teacher; his practice was to talk or converse, 'to prattle without end,' as his enemies said. 'Early in the morning, he frequented the public walks, the gymnasia for bodily training, and the schools where youths were receiving instruction; he was to be seen in the market-place when most crowded, among booths and

tables where goods were exposed for sale. His whole day was usually spent in this public manner. He talked with any one, young or old, rich or poor, that sought to address him, and in the hearing of all who chose to stand by. He visited all persons of interest in the city, male or female; his friendship with Aspasia is well known; and one of the most interesting chapters of Xenophon's *Memorabilia* recounts his visit to and dialogue with Theodotê—a beautiful *hetæra*, or female companion. Nothing could be more public, perpetual, and indiscriminate as to persons than his conversation; and as it was engaging, curious, and instructive, certain persons made it their habit to attend him in public as companions and listeners. These men, a fluctuating body, were commonly known as his disciples or scholars, though neither he nor his personal friends ever employed the terms *teacher* and *disciple* to describe the relation between them.'—Grote's *Greece*, chap. lxviii.—As to his married life, see XANTHIPPE.

Another peculiarity of S. was his persuasion of a special religious mission. He had been accustomed all his life to hear what he considered a divine voice, or preternatural sign, which came to him solely as a prohibition or warning, never as an instigation to act. In deference to it, he had kept back from entering public life; and it caused him to refrain from premeditating the defense that he made on his trial. Nor was this all; relying, like his countrymen, on divine intimations by dreams and oracles, he believed that his mission had been signified to him by these. One oracular intimation in particular he described in his defense as the turning-point of his life. An admirer and friend of his, Chærephon, about the time when S. began to have some repute as a wise man, consulted the oracle at Delphi as to whether any man was wiser than Socrates. The priestess replied: 'None.' The answer, S. said, perplexed him very much; for he was conscious of no wisdom on any subject, great or small. At length, he resolved to put the matter to the test by taking measure of the wisdom of other persons as compared with his own. Selecting a leading politician, accounted wise by himself and by others, he put a series of questions to him, and found his supposed wisdom no wisdom at all. He next tried to demonstrate to the politician himself how much he was deficient: but found him impracticable on this head, refusing to be convinced. He then saw a meaning in the oracle, to the effect that his superiority to others lay not in his wisdom, but in his being fully conscious of his ignorance. He tried the same experiment on other politicians and rhetors, then on poets, lastly on artists and artisans, and with the same result. Thereupon he considered it a duty imposed on him by the Delphian god to cross-question men of all degrees as to their knowledge, to make them conscious of their ignorance, and thereby put them in the way of becoming wise. We shall see presently wherein this low view of the human intelligence differed from the contemptuous tone of a mere satirist.

The intellectual characteristics of S., through which he

has influenced the whole subsequent course of human thought, may be stated under three heads: 1. Subject, 2. Method, and 3. Doctrine.

1. As to Subject.—Here he effected a signal revolution, metaphorically expressed by the saying of Cicero that 'Socrates brought down philosophy from the heavens to the earth.' The previous philosophies consisted of vast and vague speculations on nature as a whole, blending together Cosmogony, Astronomy, Geometry, Physics, Metaphysics, etc. S. had studied these systems, and they left on his mind a feeling of emptiness and unsuitability for any human purpose. It seemed to him that men's endeavors after knowledge would better be directed to the human relationships, as involving men's practical concerns He could not go to any public assemblage without hearing questions agitated respecting the just and unjust, the honorable and base, the expedient and hurtful; moreover, he found that the opposing disputants were, without knowing it, very confused in their ideas as to the meanings of those large words in which the weightiest interests centred. Accordingly, he was the first to proclaim that 'the proper study of mankind is man;' human nature, human duties, and human happiness made up a field of really urgent and profitable inquiry. In astronomy, he saw a certain utility for navigation and for the reckoning of time, to which extent he would have it known by pilots and watchmen; geometry was useful in its literal sense of land-measuring; arithmetic he allowed in like maner so far as practically useful; but general physics, or the speculations of philosophers, from Thales downward, as to the origin of all things out of water, fire, air, etc., he wholly repudiated. 'Do these inquirers,' he asked, 'think that they already know *human* affairs well enough, that they thus begin to meddle with divine? Do they think that they shall be able to excite or calm the winds at pleasure, or have they no other view than to gratify an idle curiosity?' He considered it not only unprofitable but impious to attempt to comprehend that department. The gods, he thought, managed all those things after their own fashion, and refused to submit them to invariable laws of sequence, such as men might discover by dint of study; the only means of knowledge permitted was religious sacrifice and prayer, and the consultation of the oracles. While this was the appointed way in reference to divine things, it was equally appointed that human things should be learned by diligence in study and investigation. The prevailing polytheism he sought to cleanse from its impurity and to raise from its imbecility; not denying the gods, but declaring it incredible that they should, as the legends and poets declared, have committed acts disgraceful in the worst of men. He held a strong conviction of the existence of a wise and beneficent Supreme Being, the creator of the universe; of whose nature he held that man, as His offspring, partook. Thence he mantained, as the proper inference by faith, the doctrine

of man's immortality, though not claiming this as an article of his knowledge.

2. In regard to Method, S. was author of still greater innovations. It was to little purpose that men applied themselves to human affairs if they conceived them loosely, with no regard to evidence. S. introduced at least one fundamental element of logical precision into the handling of questions, by insisting on accuracy in Definition and Classification. His mode will be seen in the statement of Xenophon: 'Socrates continued incessantly discussing *human* affairs, investigating—What is piety? What is impiety? What is the honorable and the base? What is the just and the unjust? Men that knew these matters, he accounted good and honorable; men that were ignorant of them, he assimilated to slaves.'

His investigation thus took the form of ascertaining the exact meaning—that is, the definition—of the leading terms in ethics and in politics, the settling of what J. Stuart Mill calls the *connotation* of a general word, which determines how to apply it rightly to each individual case. The very idea of defining a general term, now so obvious, never seems to have suggested itself to any one previous to Socrates. Also his manner of seeking out those definitions is characteristic, and links itself to his conversational method and his convicting men in general of ignorance in things that they thought they knew. Professing himself able to furnish no exact definition (this professed ignorance was called the Socratic irony) of justice, temperance, courage, etc., and finding every one else quite confident in their ability to supply the want, he asked some one to state his definition; and on its being given, he put a few further interrogations (as he said) by way of making sure that he understood the meaning, but with the speedy effect of driving the respondent into a humiliating self-contradiction. His method is most fully exemplified in certain of the Platonic dialogues, as the first *Alcibiadês*, *Lachês*, *Charmidês*, *Euthyphron*, etc. According to Xenophon, he could pass from his severe cross-examining method, with its humiliating shock of convicted ignorance, and address to his hearers plain and homely precepts, inculcating self-control, temperance, piety, duty to parents, brotherly love, fidelity in friendship, diligence, etc.—such direct admonitory influence being common to him with the so-called Sophists. He probably went beyond the ordinary teaching of the Sophists in exhorting men 'to limit their external wants, to be sparing in indulgence, and to cultivate, even in preference to honors and advancement, the pleasures arising from a performance of duty, as well as from self-examination and the consciousness of internal improvement.' This strain of exhortation, his manner of life in harmony therewith, and the virtual self-immolation of his death, may be considered as the conjoint root of the Cynic and the Stoic philosophies.

3. As regards Doctrine, S. was distinguished—after his tenet of one God supreme above all gods, and the Father of men—chiefly by his theory of virtue. Virtue, he said,

consisted in knowledge. To do right was the only road to happiness; and as every man sought to be happy, vice could arise only from ignorance or mistakes as to the means: hence the proper corrective was an enlarged teaching of the consequences of actions. We cannot, on any fair interpretation of knowledge alone, regard this as other than a one-sided view. It takes note of one condition of virtue, since there can be no right conduct without understanding the tendency of actions, or, at all events, the meaning of rules; but it omits, what is also essential, the state of the emotions or dispositions, which may be directed either to exclusively self-regarding ends, or to ends involving also the good of others. There is an obvious connection between the doctrine and the Socratic analogy of virtue to the professions. The virtue of an artisan is contained almost exclusively in his skill or knowledge; his dispositions can usually, though not always, be depended on through the pressure of his immediate self-interest. But the practice of Socrates was larger than his theory; for, as already remarked, his exhortations were addressed to men's feelings or sentiments as well as to their intellect. His political doctrines were biased by the same analogy of special professions. The legitimate king or governor was he alone that knew how to govern well.

It was not under the government of the Thirty Tyrants, but under the reconstituted democracy, that Socrates was put to death. B.C. 399 an indictment was laid against him, in the following terms: 'Socrates is guilty of crime: first, for not worshipping the gods whom the city worships, and for introducing new divinities of his own; next, for corrupting the youth. The penalty due is death.' The trial took place before a dikastery, or law-court, composed of citizen-judges, like our juries, but far more numerous; the number present seems to have been 557. His defense is preserved by Plato, under the title *Apology of Socrates.* The tone of it, so admirable to us, was such as to make acquittal almost impossible, from the number of enemies created by his cross-questioning annoyance of all classes of men, and from various other causes. He dwelt on his mission to convict men of ignorance for their ultimate benefit; pronounced himself a public blessing to the Athenians; declared that, if his life was preserved, he would continue in the same course; and regarded the prospect of death with utter indifference. By a vote, according to the most probable account, of about 280 to 220, the charges were declared proven. A vote had then to be taken on the sentence. By the Athenian practice, the accuser named a penalty, and the accused was asked to do the same; the judges were restricted to one or other of these. The accuser named death. Socrates, maintaining the same high tone, declared at first that he deserved the highest public reward; but, on the instigation of his friends, he ended

by proposing a trifling fine. The court, by a majority, decided for the capital sentence. There was an accidental interval of 30 days before the execution, during which Socrates in prison conversed with his friends as usual; on the last day occurred his conversation on the Immortality of the Soul, referred to in the Platonic dialogue called *Phædo.* He then drank the hemlock, and passed away with the dignity and calmness becoming his past life.

'There can be no doubt,' says Mr. Grote, 'that the individual influence of Socrates permanently enlarged the horizon, improved the method, and multiplied the ascendant minds of the Grecian speculative world, in a manner never since paralleled. Subsequent philosophers may have had a more elaborate doctrine, and a larger number of disciples who imbibed their ideas; but none of them applied the same stimulating method with the same efficacy; none of them struck out of other minds that fire which sets light to original thought.'—See Grote's *Greece;* Zeller's *Philos. der Griechen;* Zellner, *Socrates and His Circle;* and Phelps, *Socrates.*

SOCRATIC, a. *sō-krăt'ĭk,* or SOCRAT'ICAL, a. *-ĭ-kăl:* pertaining to the philosophy of *Socrates,* or to his method of teaching. SOCRAT'ICALLY, ad. *-lĭ.* SOCRATIST, n. *sŏk'-ră-tĭst,* a disciple of Socrates, a celebrated anc. Greek philosopher. SOC'RATISM, n. *-tĭzm,* the philosophy of Socrates.

SOD, n. *sŏd* [Low Ger. *sode;* Dut. *zode;* Fris. *satha,* a turf: Gael. *sod,* turf]: turf; sward; a piece of turf. SOD'DED, a. covered with sod. SOD'DY, a. *-dĭ,* turfy.

SOD, v. *sŏd:* did seethe, pt. of SEETHE, which see.

SODA, n. *sō'dă* [Ger., It. *soda;* F. *soude;* OF. *soulde,* glasswort—from L. *solĭdus,* firm]: substance obtained from the ashes of certain sea-plants, or from sea salt; familiar name for *carbonate of soda* (sodium carbonate or sodic carbonate). SO'DALITE, n. *-līt* [Eng. *soda,* and Gr. *lithos,* a stone]: mineral consisting chiefly of silicate of alumina and soda, found of a white, gray, yellowish, greenish, or blue color, and of a vitreous lustre. SODIC, a. *sō'dĭk,* combined with sodium; of or pertaining to sodium. SO'DIUM, n. *-dĭ-ŭm,* an elementary body forming the metallic base of soda, soft, of a silvery lustre, and lighter than water. SODA-WATER, a water supposed to contain a little soda, and highly charged with carbonic acid (see AERATED WATERS). CAUSTIC SODA, the hydrated oxide of sodium. CARBONATE OF SODIUM, a salt compounded of carbonic acid and sodium. BICARBONATE OF SODIUM (sodic bicarbonate), only slightly alkaline, and not caustic, used in the preparation of effervescing drinks and medicinal soda-water. SULPHATE OF SODIUM, Glauber's-salts. SULPHITE OF SODIUM, important for its sulphurous acid. SODIC NITRATE, a substance occurring in deposits of great extent in Peru and Brazil, etc., employed in the manufacture of vitriol and of artificial

manure.—See SODIUM. *Note.*—Popularly all the salts of sodium (sulphates, chlorates, etc., sulphides, chlorides, etc., sulphites, chlorites, etc.) are called sulphates, sulphides, sulphites, etc., of *soda.* The chemical nomenclature is sodium sulphate, etc.; or sodic sulphate, etc.; or sulphate, etc., of sodium.

SODA NITRE: native sodium nitrate, $NaNO_3$. It is a colorless, deliquescent mineral, crystallizing in the rhombohedral system, but usually massive in beds. It occurs near Lovelock's, Nevada, and near Calico, Cal., and in vast beds in Chile, where it is extensively mined. It is one of the most important fertilizers and is also used in the manufacture of nitre.

SODA WATER: a beverage consisting of one, two, or three drams of carbonate of soda, dissolved in a pint of water highly impregnated with carbonic acid.

SO'DALITE: a widely-distributed rock-forming mineral. It is a common constituent of volcanic rocks, especially elæolite-syenites, in which it occurs in isometric crystals or in grains or massive in veins. A sodalite-trachyte abounds in the island of Ischia, near Naples, while fine, white crystals occur in the bombs of Vesuvius. It is best known, however, as a cleavable-massive mineral of rich azure-blue color. It is found thus at Litchfield, Me., in Ontario and British Columbia, and is well adapted for use as an ornamental stone. Its hardness is 5.5 to 6; specific gravity 2.14 to 2.34; lustre vitreous or greasy; composition, aluminum and sodium orthosilicate with sodium chloride.

SODALITE GROUP: includes sodalite, hauynite, noselite and lazurite, all minerals crystallizing in the isometric system and of unusual interest chemically because they are isomorphous compounds of an orthosilicate with the salt of another acid or with a haloid. Their relations to the Garnet group have been developed by Brögger.

SODALITY, n. *sō-dăl'ĭ-tĭ* [L. *sodalĭtas* or *sodalĭtātem,* fellowship—from *sodālĭs,* a mate, a fellow]: a fellowship; a fraternity; a brotherhood.

SODDEN, v. *sŏd'n:* pp. of SEETHE, which see; boiled; seethed; applied to bread not well baked; doughy.

SODDEN, v. *sŏd'n* [see SEETHE]: to soak; to saturate; to be soaked.

SODER, v. n. *sō'dėr:* OE. for SOLDER.

SODIUM (from 'soda,' which word was used in the Middle Ages to designate alkaline substances in general): a metallic element, first prepared by Davy in 1807, by the electrolysis of molten caustic soda, or sodium hydrate. In 1808 Gay-Lussac and Thénard showed that the metal can be prepared by reducing the hydrate with finely divided metallic iron. Brunner, about 1823, obtained metallic sodium by reducing sodium carbonate with carbon; and Deville, in 1855, improved Brunner's

process so as to make it commercially practicable for the manufacture of sodium on the large scale. Deville's method, as practiced in recent times, consists in distilling a mixture of 30 parts of calcined carbonate of sodium, 13 parts of coal, and 7 parts of lime; the reduction taking place at a temperature of about 2,500° F., the metal being given off in the form of a vapor, which is then passed into a condenser and allowed to liquefy and solidify. As thus obtained, sodium contains numerous impurities, most of which may be removed by straining the melted metal through linen under rock oil, at a temperature of about 212° F. Deville's process of manufacture was used almost exclusively until about 1886, when the well-known Castner process came into use. Castner reduced sodium hydrate by a combination of carbon and iron, prepared by coking a mixture of pitch and finely divided iron; the coked mass having approximately the composition of Fe_2C, and being commonly known as 'carbide of iron,' although it is doubtful if this name is chemically justifiable. The Castner process possesses many practical advantages over that of Deville, and hence it rapidly came into almost universal favor. A considerable quantity of metallic sodium is now prepared by the direct electrolysis of molten sodium hydrate, or sodium chloride (common salt). Sodium possesses powerful reducing properties, and the metal is used in the preparation of silicon, boron, aluminum and other elements whose reduction by means of carbon is either difficult or impossible. Deville, in fact, developed his method of preparation with the object of using the sodium that it yielded in the subsequent preparation of metallic aluminum, and for many years the commercial supply of aluminum was practically all prepared by reducing aluminum compounds with metallic sodium. Since the development of the Hall process for the manufacture of aluminum by electrolysis, metallic sodium has lost a considerable part of its former great commercial importance.

Sodium is a silvery-white metal, hard at 0° F., ductile at 32°, wax-like at ordinary temperatures, and pasty at 120°. It melts at 207° F., and boils at about 1,700°. It oxidizes with great facility, and must be kept under benzene, or petroleum, or some other fluid that is devoid of oxygen, or in a neutral atmosphere of hydrogen, coal gas, or some other substance for which it has no affinity. It may be prepared in the form of lustrous, octahedral crystals, white in color but with a rosy sheen. Like potassium, it dissolves in anhydrous liquid ammonia (NH_3), forming a blue solution from which the metal may be again obtained by the evaporation of the solvent. Sodium has a specific gravity of about 0.98, a specific heat (in the solid form) of 0.273, and a coefficient of linear expansion (Fahrenheit scale) of 0.0000395. At the freezing point of water, the specific electrical re-

sistance of sodium is about one-eighteenth of that of mercury.

Chemically, sodium is a monad. It has the chemical symbol Na (from 'natron,' the Spanish name for native carbonate of sodium), and its atomic weight is 23.05 if $O = 16$, or 22.88 if $H = 1$. It forms a multitude of compounds, many of which are of great importance in the arts. The chloride of the metal occurs in great abundance in nature, as common salt (see SALT). Its formula is NaCl, and it is extensively used as a source of sodium in the preparation of other compounds of the metal. Sodium nitrate, $NaNO_3$, commonly known as 'Chile saltpetre, occurs native in large quantities in Chile, and as it is much cheaper than the native nitrate of potassium, it is used largely in the manufacture of ordinary nitre; chloride of potassium and nitrate of sodium reacting together to form chloride of sodium and nitrate of potassium. Sodium bromide, NaBr, which is extensively used in medicine as a sedative, is prepared by adding bromine to a solution of pure sodium hydrate, NaOH, till the liquid becomes slightly yellow. It is then evaporated to dryness, and strongly heated to decompose the bromate, $NaBrO_3$, which is formed simultaneously with the bromide; after which the residue is re-dissolved and crystallized by evaporation.

Two oxids of sodium are known. Sodium monoxid, Na_2O, may be prepared in several ways, but it is doubtful if it has yet been obtained in a state of absolute purity. It is formed when metallic sodium is oxidized in dry air or dry oxygen, at ordinary temperatures; but it is said that some small trace of moisture must be present, in order for the oxidation to proceed. The monoxid is a grayish solid, having a powerful affinity for water, with which it combines to form sodium hydrate (NaOH), as indicated by the equation $Na_2O + H_2O = 2NaOH$; the combination being attended by the development of a considerable quantity of heat. The monoxid may also be prepared by heating dry sodium hydrate with metallic sodium, its formation in this case being attended by the liberation of hydrogen. Sodium peroxid, Na_2O_2 (also called the 'dioxid'), is of considerable commercial importance, owing to its increasing use as a bleaching agent. It is prepared by passing a stream of dry air slowly over melted sodium at a temperature of about 570° F., the sodium being thereby converted into a mixture of the monoxid and peroxid. When all the sodium has been oxidized, the air current is replaced by a stream of dry oxygen gas, which transforms the monoxid that is present into peroxid. Sodium peroxid is soluble in water, but the solution readily decomposes with the formation of sodium hydrate and the liberation of oxygen, as indicated by the equation

$$Na_2O_2 + H_2O = 2NaOH + O.$$

The bleaching effect of the peroxid is due to this liberation of oxygen from the aqueous solution.

Sodium carbonate, Na_2CO_3, commonly known simply as 'soda,' or, in an impure form, as 'soda ash,' is one of the most important chemical substances known. It was formerly prepared mainly from the ashes of sea-plants, in the same way that carbonate of potassium is obtained from the ashes of land plants; but at the present time it is prepared almost exclusively by chemical means, from common salt. For many years the only method in use for its manufacture was that invented by Leblanc, during the first French revolution, in the latter part of the 18th century. In 1838 the 'ammonia' process was patented in England, but although this promised to be superior to the method of Leblanc, certain practical difficulties were encountered which proved to be fatal to its success, until they were overcome by E. Solvay, who erected the first commercially successful 'ammonia process' plant near Brussels, in 1861, and for whom the process itself has since been named. A certain proportion of the output of sodium carbonate is also manufactured by electrolysis; but the greater part is manufactured by the Solvay process, though the Leblanc method is still used to a considerable extent.

Leblanc Process.—In the Leblanc method for the manufacture of sodium carbonate there are two successive operations to be performed. The first of these, which is known as the 'salt-cake' process, has for its object the transformation of chloride of sodium into sulphate of sodium. For this purpose the salt (sodium chloride) is heated with sulphuric acid in large covered iron pans; hydrochloric acid being liberated in the course of the reaction, as indicated by the equation

$$2NaCl + H_2SO_4 = Na_2SO_4 + 2HCl.$$

The hydrochloric acid vapors which are thus generated are passed through a 'scrubbing tower,' which contains coke or brick, over which a stream of water is kept running; the hydrochloric acid dissolving in the water, and constituting an important by-product. The crude sodium sulphate, Na_2SO_4, is the 'salt-cake' from which this part of the process takes its name. Pure crystallized sodium sulphate (containing ten molecules of water of crystallization) constitutes the familiar substance known as 'Glauber's salt,' which is used in medicine as a saline purgative. The salt-cake, as obtained by this first operation, is subsequently treated by the 'black ash' process, which is so called on account of the color of the immediate product that it yields. Ten parts of the salt-cake are mixed with ten of limestone (calcium carbonate) and seven and a half of coke, and the mixture is heated in a reverberatory furnace, technically known as a 'balling furnace.' The carbon of the coal reduces the crude sodium sulphate to the form of sulphide of sodium, Na_2S, in accordance with the equation

$$Na_2SO_4 + 2C = Na_2S + 2CO_2;$$

while the sulphide, thus produced, is converted into so-

dium carbonate and calcium sulphide (CaS), by the limestone ($CaCO_3$), in accordance with the equation

$$Na_2S + CaCO_3 = Na_2CO_3 + CaS.$$

In practice these two reactions go on together, and the final mixture of calcium sulphide, sodium carbonate, and such impurities as may be present, is the so-called 'black-ash,' or crude soda. Calcium sulphide is insoluble in water in the presence of lime, and hence it is easy to separate the sodium carbonate from the mass by solution and subsequent crystallization. 'Crystallized soda,' or 'washing crystals,' consists of sodium carbonate crystallized with 10 molecules of water.

The Ammonia (or Solvay) Process.—The ammonia process for the manufacture of sodium carbonate depends upon the fact that when bicarbonate of ammonia, $H(NH_4)CO_3$, is added to a solution of common salt (NaCl), bicarbonate of sodium ($HNaCO_3$) and sal ammoniac (NH_4Cl) are formed, as indicated by the equation

$$NaCl + H(NH_4)CO_3 = HNaCO_3 + NH_4Cl.$$

In practice, this operation is carried out by saturating a solution of common salt with ammonia gas (NH_3), and then passing carbon dioxid gas into the solution, under pressure. Bicarbonate of ammonium is formed in the solution, but is immediately broken up with the formation of bicarbonate of sodium, as indicated by the foregoing equation. We may therefore regard the reaction as taking place directly in accordance with the equation

$$NH_3 + CO_2 + NaCl + H_2O = HNaCO_3 + NH_4Cl.$$

The sal ammoniac, being quite soluble, remains in solution; while the bicarbonate of sodium, being relatively insoluble, is obtained in the solid form. The bicarbonate, when dried and strongly heated, gives off carbon dioxid gas and is converted into the normal carbonate, as indicated by the equation

$$2HNaCO_3 = Na_2CO_3 + CO_2 + H_2O;$$

the carbon dioxide thus freed being again used in the first stage of the process. The sal ammoniac that is formed during the process is recovered from solution by evaporation, and the ammonia that it contains is liberated by the action of lime or magnesia. The reaction in the case of magnesia is

$$2NH_4Cl + MgO = MgCl_2 + 2NH_3 + H_2O;$$

the ammonia being used over again, just as the carbon dioxid is. The magnesium chloride, $MgCl_2$, may be thrown away, or it may be resolved, by the action of heat, into magnesia and hydrochloric acid, as indicated by the equation

$$MgCl_2 + H_2O = MgO + 2HCl;$$

the hydrochloric acid so obtained constituting a by-product, just as it does in the Leblanc process.

Sodium carbonate is used in the arts for the greatest variety of purposes. When a stream of carbon dioxid is passed through a saturated solution of the carbonate,

sodium bicarbonate (or hydrogen sodium carbonate), $HNaCO_3$, is formed; and, as has already been stated, the bicarbonate may be again transformed into the carbonate by the action of heat. Sodium bicarbonate is used in the manufacture of baking powders, in the preparation of effervescing drinks, in medicine, and for many other purposes.

Sodium hydrate, sodium hydroxide, or 'caustic soda,' may be prepared by boiling lime (calcium hydrate) with sodium carbonate, the reaction being

$$Ca(OH)_2 + Na_2CO_3 = CaCO_3 + 2NaOH.$$

The carbonate of calcium that is formed at the same time is practically insoluble, and by allowing it to subside, and evaporating the supernatant liquid to dryness, sodium hydrate is obtained in the form of a white fibrous mass. The hydrate melts at a red heat, deliquesces in the air, and absorbs carbon dioxid gas even from the air, passing then into the carbonate. Sodium hydrate is formed when metallic sodium is thrown upon water, the water being decomposed with the liberation of free hydrogen, according to the equation

$$Na + H_2O = NaOH + H.$$

The heat developed by this reaction is not in general sufficient to ignite the liberated hydrogen. (Compare POTASSIUM.) Sodium hydrate is intensely alkaline, and large quantities of it are used in the manufacture of soap, in the mercerizing of cotton, and for many other purposes.

Of the remaining compounds of sodium, the borate, silicate, phosphate, and hyposulphite may be especially mentioned. Borax, or sodium tetraborate, $Na_2B_4O_7 + 10H_2O$, occurs native, the chief supply of the United States now coming from California. Sodium silicate, Na_2SiO_3, commonly known as 'water glass,' is prepared by melting quartz sand with sodium carbonate. It is soluble in water, and is largely used in the manufacture of artificial stone. Three phosphates of sodium are known, phosphoric acid being tribasic. The one which is understood when 'sodium phosphate' is mentioned without qualification, is the hydrogen di-sodium phosphate, whose formula is HNa_2PO_4. Hyposulphite (or thiosulphate) of sodium, commonly known as 'hypo,' has the formula $Na_2S_2O_3 + 5H_2O$, and is prepared by passing a stream of sulphur dioxid gas through a solution of sodium sulphide and sodium hydrate, and then crystallizing the solution by evaporation. It is extensively used in photography for 'fixing' negatives and silver prints; its action depending upon its power of dissolving such parts of the silver salts as have not been reduced by the action of light, or the developer. 'Hypo' is also used by paper makers as an antichlor, for neutralizing the last traces of the chlorine that may be left in the pulp, after it has been bleached with 'chloride of lime.'

In general, the salts of sodium are closely analogous

in all respects to those of potassium, so that for most purposes a salt of either of these metals may be substituted for the corresponding salt of the other one. Salts of sodium that are volatile in the flame of the Bunsen burner communicate to that flame an intense orange-yellow color, and when the light from such a flame is examined through the spectroscope, the color is found to be due to a close pair of lines in the orange-yellow region, which coincide with the 'D' lines of the solar spectrum. The light from a flame that is colored by volatile sodium salts is nearly monochromatic, and such flames are therefore used in numerous physical experiments, in which the production of light of a single wave-length is desired.

SODOM, *sŏd'om*, APPLE OF: name given to the fruit of a species of *Solanum*. But it seems that the true APPLE OF SODOM, or MAD APPLE, of the shores of the Dead Sea, mentioned by Strabo, Tacitus, and Josephus, and described as beautiful to the eye, but filling the mouth with bitter ashes if tasted, is a kind of gall, growing on dwarf oaks, and produced by a species of gall-insect, *Cynips insana*. These galls are about 2 in. long, and 1½ in. in diameter, of a beautiful, rich, glossy, purplish-red color, and filled with an intensely bitter, porous, and easily pulverized substance, surrounding the insect. They are attached to the twigs in a curious manner, different from other galls, the narrow end rising upward on each side, and bending inward, so as to clasp the extremity of the twig somewhat like a pair of wide and curved nippers.

SODOMA, or SODDOMA, *sŏd'ō-mâ* (properly SODONA, or SODDONA): 1479-1549, Feb. 14: Italian painter: b. Vercelli, Piedmont. His name was Giannantonio Bazzi (corrupted into Razzi): Sodona, with which name his pictures were signed, appears to have been a family name. A pupil of Giovenone of the Lombard school, he combined its strong coloring and other characteristics with those of the school at Siena, where he spent most of his life. He was among the first there to develop fully the Cinquecento manner. He completed, adding 17 frescoes, the life of St. Benedict in the monastery of that saint at Monte Oliveto, where the monks named him Madcap, from his gaudy dress and frolicsome spirit. At Rome, his Vatican frescoes were replaced by Raphael's. In the Chigi palace (now Farnesina) he painted scenes from the life of Alexander. A gift by him of the *Death of Lucretia* to Pope Leo X. procured him the title Cavaliere. His finest works are at Siena. In St. Catherine's Chapel in S. Domenico is his admired picture of that saint in ecstacy. In S. Francesco are the *Deposition from the Cross*, and *Christ Scourged*—regarded by many as his masterpieces. At Pisa is a *Sacrifice of Abraham*, and in Florence a *St. Sebastian*. He was a master in expression, motion, and color, though often hasty and careless.

SOD'OM AND GOMORRAH, *go-mŏr'rah:* two ancient cities of Syria, almost invariably spoken of in conjunction in the Bible, and forming with Admah, Zeboiim, and other towns, the 'cities of the plain,' which, for the enormous wickedness of their inhabitants (indicated in the term Sodomy), are said to have been overthrown—not submerged—by some terrible convulsion of nature. Modern writers on sacred topography are not agreed as to the precise site of these cities, no trace of which remains; the majority holding that they stood on the s. shore of the Dead Sea, near the salt hill of Usdum; while others, apparently with more countenance from the Scripture narrative (Gen. xiii. 10-13), maintain that Sodom and the other 'cities of the plain' stood in the 'circle or plain of the Jordan,' e. from Bethel and Ai, near where the river enters the Dead Sea. The popular belief that the cities were miraculously overwhelmed by the waters of the Dead Sea, and that their remains may still be seen at the bottom, is an idle tale of superstitious travellers, uncountenanced either by any visible fact or by the account in Scripture.

SODOMITE, n. *sŏd'ŏ-mīt:* an inhabitant of *Sodom;* one guilty of an unnatural crime, attributed to the inhabitants of Sodom. SOD'OMY, n. *-mĭ,* the sin of Sodom. SOD'OMIT'ICAL, a. *-mĭt'ĭ-kăl,* pertaining to sodomy. SOD'OMIST, n. *-mĭst,* one guilty of sodomy.

SOE, n. *sō* [AS. *saa;* F. *seau;* Ger. *sau,* saw]: tub with two handles, carried by means of a pole passing through the handles; a large wooden vessel for water.

SOEMMERING'S GAZELLE, *söm'mėh-rĭngz ga-zĕl* [after Dr. Samuel Thomas *Soemmering,* a German anatomist]: in *zool., Antilope Soemmeringii,* from e. Abyssinia. It is about 30 in. high, sandy fawn above, with massive lyrate horns, which are more slender in the female.

SOEMMERING'S MIRROR, *söm'mėh-rĭngz:* instrument for drawing objects under the microscope. It is a plane mirror of polished steel, less in diameter than the pupil of the eye, supported opposite the focus of the eye-piece. It inverts the objects.

SOEVER, *sō-ĕv'ėr* [*so,* and *ever*]: only used in composition to extend or render emphatic the sense of who, what, where, when, etc.

SOFA, n. *sō'fă* [F., Sp. *sofa;* Ar. *suffah,* a sofa—from *saffa,* to dispose in order]: a long seat with stuffed bottom, back, and ends. SOFA-BED, or SOFA-BEDSTEAD, a sofa so contrived as to include a bed.

SOFALA, *sō-fâ'lâ,* or CEFOLA: region on the e. coast of Africa, from the delta of the Zambezi to Delagoa Bay, i.e., lat. 18°—26° s. This stretch of coast now comprehends the Portuguese captaincies of Rio de Sanna, Teté, Sofala, and Inhambane, besides the regions round Delagoa Bay, nominally under the crown of Portugal,

the extent inland being generally limited by the mountain region parallel to the coast of s. Africa, and forming a belt of low country about 150 m. wide, full of swamps, densely wooded, and generally unfavorable to European life. See MOZAMBIQUE.

Sofala, in common with the remainder of the coast of e. Africa, was conquered by the Arabs between the 8th and 12th centuries; it was visited 1480 by Pedro Cavalho, a Portuguese captain, from Abyssinia before the route by sea to India was discovered. In 1500 the Portuguese, under Albuquerque, commenced making settlements on this coast, and built a strong fort on an island in the mouth of the Rio de Sofala, near a town which was founded 200 years before by the Arabs, and which still exists, though in decay. The inland region at the back of the coast district, now occupied by the Transvaal Boers toward the s., or by the Amatabele to the n., and stretching n. for an indefinite distance, formed the celebrated though mythical empire of Monomotapa, the accounts of which by the early travellers are marvelous. Sofala was considered by the old geographers as a very rich, gold-producing country, and was by some judged (without sufficient basis) to be the Golden Ophir to which King Solomon every three years sent a fleet of ships. Sofala has long ceased to produce much gold.

Although nominally under Portuguese rule, yet that authority rarely extends outside the walls of the miserable forts held by its agents. It is computed that on the whole of the Portuguese settlements on the e. coast of Africa there are not more than 500 colonists of European birth. The natives, generally, are of the negro type, gradually approximating to the more intellectual Zulu Kafir as we proceed from the Zambezi to Delagoa Bay. Principal exports are ivory, bees-wax, hides, and rhinoceroses' horns: clandestine traffic is said to be carried on in slaves. Considerable amounts of gunpowder, lead, coffee, and European clothes find their way up from the coast to the Boer settlements in the highlands of the interior. The coast-line is generally low and sandy; and dangerous to approach, on account of shoals and sand-banks. A group of islands, called Bazaruta, lie off the coast n. of Cape San Sebastian, lat. 22° s. The best harbor is that of Inhambane, and ships may ascend to the town, about 8 m. from the mouth of the river. The harbor at the mouth of the Rio de Sofala is difficult of access on account of its bar.

SOFFIT, n. *sŏf'fĭt* [F. *soffite*—from It. *soffitta*, a soffit—from L. *suffixus*, fastened beneath or below—from *sub*, under; *figo*, I fix]: in *arch.*, the under-side of an arch or cornice, presenting a flat surface, and often formed into panels, as over windows, etc.; in *scene-painting*, a border.

SOFI, n. *sō'fĭ* [Pers. *sôfi*]: a priest or monk of Persia; a dervish; a religious person. SO'FISM, n. *-fĭzm*, the mystical doctrines of the SO'FIS, *-fĭz*.—See SUFISM.

SOFIA, or SOPHIA, *sō-fē'â:* city, cap. of Bulgaria since 1878; 42° 42′ 30″ n. lat., 23° 15′ 30″ e. long.; 170 m. n.w. of Adrianople, very favorably situated in a fertile plain, 1,755 ft. above sea-level, between the granite mass of the Vitosh Mts. and the Sumughu and the Etropol ranges of the Balkans. At Sofia is the junction of 5 great routes between Nish and Belgrade, Lom and Vidin, Plevna and Rustchuk, Philippopolis and Constantinople, and Kostendil and Salonica. The town is on the railroad from Belgrade to Constantinople; the region is intersected by the Kiresena, the Bladaiska, and the Bojana, tributaries of the Isker, which are connected by ditches. The climate is subject to great seasonal and diurnal changes—the annual range of temperature being from—4° in Jan. to 100° in Aug., while the daily variation is often 27° or more. Sofia is the seat of a Bulgarian archbishop or metropolitan. Of the numerous mosques, the most notable is that of Buyuk-Jami, with its 9 gilded metal cupolas; of greater historic interest is the old Sophia mosque (Hagia Sophia), originally a Christian church, and now again consecrated to Christian rites. Since Sofia became the capital of Bulgaria, a 'European' town has grown up around the royal palace in an e. suburb; the remainder of the city retains its Turkish character. The industries of Sofia are weaving of fabrics of wool and of silk, and dyeing; also cultivation of fruits and tobacco. Its situation makes it a commercial centre for the Balkan peninsula. Exports are hides and skins (to Vienna), and especially goat-skins (to Marseilles); principal imports are wheat, maize, and alcoholic liquors. —Anciently Sofia was called Sardica. Here about 343 was held a church council.—Pop. (1900) 67,920.

SOFT, a. *sŏft* [Dut. *zacht;* Ger. *sacht, sanft;* Low Ger. *sagt;* AS. *sefte,* soft: in one sense comp. Gael. *saobh,* foolish, deranged]: not hard; easily yielding to pressure; not rough; not violent; smooth to the touch; flowing; easily yielding to persuasion or any influence; impressible; gentle; mild; delicate; weak; simple; not unfeeling; not strong or glaring; pleasing to any sense; not tinged with salts, as water; in *OE.,* still; easy; AD. softly; gently; quietly: INTERJ. hold! stop! N. in *slang,* one weak in intellect; a foolish person. SOFT'LY, ad. *-lĭ,* without hardness; not forcibly; not loudly; gently; mildly. SOFT'NESS, n. *-nĕs,* the quality of being soft; smoothness; delicacy; mildness; effeminacy. SOFT'ISH, a. *-ĭsh,* somewhat soft. SOFTEN, v. *sŏf'n,* to make soft; to grow soft; to mollify; to calm; to make less harsh or severe; to make less glaring; to grow less obdurate, cruel, or rude. SOFT'ENING, imp. *-ning:* ADJ. making less hard or fierce: N. the act of making less hard or cruel, etc.; in *paint.,* the blending of colors into each other. SOFT'ENED, pp. *-nd:* ADJ. made less hard or harsh. SOFT'ENER, n. *-nėr,* one who or that which softens. SOFT'Y, n. *-ĭ,* a foolish person. SOFT-HEADED, a. of weak intellect. SOFT-

HEARTED, a. susceptible of pity; meek; gentle. SOFT-SAWDER, *-saw'dĕr* [corruption of Eng. *soft-solder:* comp. Ger. *suade,* gift of the gab]: flattery; something that easily pleases and tickles. SOFT-SPOKEN, a. having a mild or gentle voice; affable. SOFTENING OF THE BRAIN, in *pathol.,* disease of which there are three forms, the white, the red, the yellow. White, or atrophic, softening arises from imperfect nutrition, and occurs often with other diseases in weakly persons approaching old age. Red softening, formerly attributed to prior inflammation, may arise from abrupt obstruction of an artery, followed by venous engorgement and the rupture of some of the neighboring vessels. Yellow softening follows the effusion of blood, either from the minute vessels (red softening) or from a larger one (apoplectic clot); it soon runs a fatal course. The distinction between the three forms can seldom be made with certainty during life. The symptoms of softening depend altogether upon the extent, and especially upon the location, of the area affected. See BRAIN. TO WALK SOFTLY, in *OE.,* to be weak and out of spirits, as by excessive grief.—SYN. of 'soft, a.': ductile; facile; malleable; flexible; yielding; tender; timorous; mild; gentle; kind; meek; civil; pusillanimous; complaisant; effeminate; delicate; fine; weak; simple; smooth; flowing;—of 'soften': to mollify; compose; mitigate; palliate; alleviate; enervate.

SOFTA, or SOPHTA, n. *sŏf'tă* [said to be from Pers. *suchteh* or *sokhta,* burnt with fire—from the supposition that they were similarly burning with the thirst for knowledge]: term applied generally to young men of Turkish race in Constantinople and throughout Turkey, who, as the superior race, are, without exception, engaged in professional studies for offices in the church, the law, the army, or the state. The term is often restricted to students of the Koran.

SOFT'ENING AND INDURATION: terms used to express a pathological diminution and augmentation of the consistence of the tissues or organs of the body. These changes may arise from inflammatory action; but softening may be induced also by causes totally distinct from inflammation, e.g., from deficient supply of blood, or from long-continued functional inactivity (as in the case of paralyzed muscles). Among the parts liable to both softening and induration are the brain and spinal cord, the heart, the lungs, the serous and mucous membranes, the liver, the spleen, the kidneys, the uterus, and the bones and cartilages.

SOFT-GRASS (*Holcus*): genus of grasses having a lax panicle, two-flowered spikelets, with two nearly equal glumes. The species are not numerous. The English name is from the soft and abundant pubescence of the British species, which are two in number, CREEPING SOFT-GRASS (*H. mollis*) and WOOLLY SOFT-GRASS, or MEADOW SOFT-GRASS (*H. lanatus*), both perennial grasses,

and both very common. Meadow Soft-grass is found most abundantly on damp, moorish, or peaty soils, on which it is sometimes sown, as it yields abundant herbage; but it is very inferior to some other grasses, and unsuitable for rich meadows and pastures. Creeping Soft-grass, generally on dry, sandy, or other light soils, much resembles Meadow Soft-grass, but is still more downy, and smaller. The roots sometimes extend 5 or 6 ft. in a season. They contain much nutritious matter, and are very acceptable food to horses and cattle, but especially to hogs, which grub them up for themselves.

SOGDIANA, *sŏg-dĭ-ā'nâ:* prov. of the Persian empire in the time of Darius; now Samarcand and Bokhara. After Alexander's conquest, Sogdiana and Bactria formed one satrapy. It was governed by Greek dynasties till the middle of B.C. 2d century, when the Bactrian Greek kingdom was overwhelmed by the flood of Scythian invaders.

SOHAR, Arabia: a seaport on the s.e. coast, on the Gulf of Oman, 230 m. n.w. of the capital, Muskat. It is a walled town and its chief buildings are a castle and synagogues. There are iron-foundries and other metal-works, also a considerable weaving industry, and the lands of the vicinity are highly cultivated. As early as the 10th century it was an important centre of trade. In the period extending from the 16th to the 17th century, it was occupied by the Portuguese. Pop. 24,000.

SOHN, KARL FERDINAND: German painter: b. Berlin 1805, Dec. 10; d. 1867, Nov. 25. He studied under Schadow; was appointed professor in the Academy of Düsseldorf in 1838. Among his most celebrated pictures are *Rinaldo and Armida* (1827); *Diana and Actæon* (1833); *The Judgment of Paris* and *Romeo and Juliet* (1836); *Tasso and the Two Leonaras* (1838).

SOHO, int. *sō-hō':* an exclamation used to attract the attention of a person at a distance.

SOI-DISANT, a. *swaw-dē-zâng'* [F.]: calling himself; would-be; pretended; self-styled.

SOIL, n. *soyl* [OF. *soil,* the mire wherein a wild boar wallows: Sw. *söla,* to wallow: Dan. *söle,* to daub, to dirty; *söl,* mire, mud]: filth; any foul matter upon another substance; a stain; dung: V. to tarnish; to defile; to pollute; to dirty; to besmear; to bedaub. SOIL'ING, imp. SOILED, pp. *soyld:* ADJ. stained; tarnished. SOILURE, n. *soyl'ūr,* in *OE.,* stain; pollution. SOIL-PIPE, the pipe that conveys from a dwelling-house foul or waste water. TO TAKE SOIL, to run into the water, as a deer when pursued.—SYN. of 'soil, n.': dirt; pollution; spot; foulness; dung; compost; manure;—of 'soil, v.': to dirty; dirt; besmear; daub; bedaub; pollute; defile; foul; befoul; begrime; bemire; bespatter; tarnish; stain; sully; contaminate.

SOIL, n. *soyl* [F. *sol*—from L. *solum,* the ground,

oil]: a term used to designate the superficial portion of the earth's surface composed of broken and disintegrated rock mixed with varying proportions of decayed and decaying animal and vegetable matter (humus). For the entire mantle of unconsolidated material covering the earth's surface and includng the soil Merrill proposes the name *regolith.* The soil proper is the upper portion of the regolith. In humid regions as a rule it is easy to trace the gradation from *soil* proper at the surface through *subsoil* to the underlying undecomposed rock. The subsoil is distinguished from the surface soil mainly by a smaller percentage of organic matter and greater compactness, the latter being due to the accumulation of finer particles carried down by percolating water (clay subsoil) or to the formation of *hardpan* resulting from the compacting effect of continued cultivation at a uniform depth or to the cementing action of salts formed in the soil (calcareous and alkali hardpan). Hilgard has shown that on account of the absence of the leaching action of water, the soils of arid regions are often uniform to a great depth, there being little or no distinction between soil and subsoil, although under irrigation and cultivation calcareous and alkali hardpan frequently makes its appearance.

Origin, Formation, and Classification.—Soils have in the main been derived from the solid rock of the earth's crust through the disintegrating (weathering) and transporting action of various agencies, among which are changes of temperature (heat and frost), moving water or ice (glacial action), chemical action of air and water, and the influence of animal and vegetable life (including the action of micro-organisms); and since some of these agencies are continually at work the properties of soils are constantly being more or less modified. Soils are grouped according to the method of their formation into two main classes: (1) *Sedentary soils* formed by the weathering of rock in situ (residual deposits) or by the extensive accumulation of organic matter as in case of marsh or peat soils (cumulose deposits); and (2) *transported soils* composed of materials transported from other localities than that in which the soil is found by water, ice (glaciers), or wind. Under residual soils Merrill includes such as are composed of 'those products of rock degeneration which are today found occupying the sites of the rock masses from which they were derived, and immediately overlying such portions as have as yet escaped destruction.'

The more important examples of transported soils are *alluvial soils,* familiarly typified in the river bottom lands and deltas like those of the Nile and Mississippi; *æolian soils* composed of materials transported by the wind and typified by the sand dunes of seacoast regions and the characteristic loess of China and other countries; and *glacial drift soils* due to glacial action. Such drift soils cover a large portion of the Northeastern and North Cen-

tral United States and are composed of the debris of disintegrated rocks of various kinds brought down from the north during the glacial period. Besides these main types of soils there are several others of more or less importance in the United States, including the soils composed of fine *volcanic ash* found in considerable areas in Kansas, Nebraska, Colorado, Montana, and other western states; *adobe,* a stiff clayey soil distributed in circumscribed areas over a large portion of the arid region of the United States; *gumbo soil,* a compact fine silty soil; and a so-called loess supposed to be of alluvial origin. In practice soils are as a rule described simply as gravelly, sandy, loamy, clayey, calcareous, humous or peaty, etc., according to the fineness of the soil particles and the proportions of sand, clay, lime, and humus. They are also distinguished as light or heavy, but as so used these terms do not refer to the actual weight of the soil, but rather to the ease with which it is cultivated. Thus sandy soils, which are termed 'light' in an agricultural sense, are actually heavier than clay soils, which are considered 'heavy' from an agricultural standpoint.

There are almost innumerable gradations of soil types as regards chemical and physical characteristics, so that a satisfactory classification on this basis is very difficult. The Bureau of Soils of the United States Department of Agriculture, therefore, maps and classifies the typical soils of the areas it surveys on the basis of the differences in agricultural value as determined by field observations on 'the character of the soil and its relation to crops and vegetation,' supplemented, however, by physical and chemical examinations. Considering the soil mainly as a medium into which plants send their roots and from which they draw a part of their food, it is evident that its agricultural value will depend largely upon the character of the original rocks from which the soil was derived, the degree of fineness to which the material has been reduced, the amount and character of the organic admixture, as well as upon the treatment to which the soil has been subjected and the changes it undergoes under cultivation. The fertility of a soil is therefore determined not only by the store of plant food which it contains, but depends to a large extent upon the chemical, physical, and biological processes by which this plant food is rendered available to plants.

Chemical Composition and Properties of Soils.—Plants derive their ash or mineral constituents and nitrogen from the soil, and in order that a soil may produce plants it must contain these constituents in proper proportion and in assimilable condition. Nitrogen is one of the largest and most important constituents of plants, and while the ash constituents are taken up in comparatively small amounts by plants they are none the less essential to their growth. The more important soil-derived elements of plant food include chlorin, sulphur, phosphorus, silicon, potassium, sodium, calcium, mag-

nesium, and iron. Since the rocks from which soils are derived contain more or less of all the mineral elements it is not likely that any soil will be entirely lacking in any of the necessary mineral elements. Their proportion and availability for assimilation by the plant may, however, vary so widely as to cause wide differences in productiveness. The constituents of soils may be divided into three classes: (1) Active, that is, soluble in water or the root secretions of plants, and hence readily available; (2) latent, that is, not soluble in water or root secretions, and hence not readily available, but becoming so in time through natural agencies, by the application of fertilizers or soil amendments such as lime, marl, etc., or as a result of tillage; and (3) mechanical. The last is by far the largest class, constituting usually from 90 to 95 per cent of the entire mass of the soil, and chemical analysis shows it to be as a rule mainly silica or sand.

Chemical analysis shows soils to be very variable in composition, and since the processes by which soils are formed and plant food rendered available are continually going on, frequent examinations are necessary if accurate knowledge of the chemical properties of a soil at any given time or the amounts of plant food becoming available during the period of growth of a plant is to be had. While, as already intimated, chemical analysis must not be taken as an absolute guide to the fertilizer deficiencies and requirements of soils, certain general deductions have been drawn from soil analyses which may be of practical value if applied with discrimination. For example, German authorities classify soils on the basis of their chemical analysis as follows: Soils containing less than 0.05 per cent of either nitrogen or phosphoric acid are considered as poor, those containing from 0.05 to 0.10 per cent moderately rich, 0.10 per cent average or normal, from 0.10 to 0.15 per cent good, and above 0.15 per cent rich; soils containing less than 0.05 per cent of potash are classified as poor, from 0.05 to 0.15 per cent moderately rich, from 0.15 to 0.25 per cent average or normal, and over 0.25 per cent rich; loam soils containing less than 0.10 per cent of lime are classified as poor, from 0.10 to 0.25 per cent moderately rich, from 0.25 to 0.50 per cent average or normal, from 0.5 to 1 per cent good, and over 1 per cent rich; sandy soils containing less than 0.05 per cent of lime are classified as poor, from 0.05 to 0.10 per cent moderately rich, from 0.10 to 0.20 per cent average or normal. Over 0.20 per cent of lime is not often found in sandy soils.

The minimum percentages of the different mineral elements in the soils of the United States, which, according to Hilgard, chemical analysis has found to be necessary to the thrifty growth of general crops, may be summarized as follows: Potash is capable of great variation without material effect. In heavy clay uplands it may range from 0.08 to 0.05 per cent, in lighter loams

from 0.45 to 0.3 per cent, in sandy loams below 0.3 per cent, and in sandy loams of great depth may fall below 0.1 with good productiveness and durability. The proportion of lime in high sandy soils averages about 0.1 per cent, clay loam 0.25 per cent, heavy clay soils 0.3 per cent, and the proportion may rise with advantage to 1 or 2 per cent. Magnesia is seldom deficient. Iron is always present in abundance. Phosphoric acid depends for its effectiveness largely on the proportion of lime present; 0.1 per cent is usually sufficient for productiveness when accompanied by a fair supply of lime. It rarely runs higher than 0.3 per cent. Humus usually ranges in the loam uplands of the cotton states from 0.7 to 0.8 per cent; in the poorer sandy soils from 0.4 to 0.5 per cent; in the black calcareous prairie soils from 1.2 to 2.8 per cent. 'In California (and in the arid region generally) the humus percentages, as might be foreseen, average somewhat lower; lowest in light loam soils of the high mesas of southern California, where 0.3 per cent, and even less, has been found; yet these soils produce well at first, when irrigated. Percentages of 0.45 to 0.60 of humus are common in good upland soils that are neither very calcareous nor highly ferruginous. The prairie or black adobe soils usually range from 1.2 to 1.8 per cent—a very few as high as 3. On the whole, the highly ferruginous soils are remarkable for large amounts of humus.' Humus is not only important as a source of supply of nitrogen, but also of other plant food constituents—potash, phosphoric acid, lime, etc. According to Snyder, the proportion of these constituents combined with humus to form humates represents to a large extent the amounts available in the soil. An important property of soils, which is partly chemical and partly physical, is their absorptive power for fertilizing constituents which prevents these constituents from being lost in the drainage or dissipated in other ways before the plant can utilize them. Of the more important fertilizing constituents soils apparently have the least retentive power for nitrogen (in the form of nitrates) and the greatest for phosphoric acid. Soils apparently hold lime less tenaciously than potash since it has been shown that when potassium chlorid is added to a soil the potash is retained by the soil and lime of the soil passes into the drainage in combination with the chlorin.

Physical Properties and Processes.—The physical properties of soils which are of special importance are color, weight, fineness of division or texture, arrangement of particles or structure, adhesiveness and relations to heat, gases, water, and dissolved solids. The physical properties of soils are due largely to their natural characteristics and can at best be controlled to only a limited extent by man, and therefore the practice of selecting solids with special reference to the suitability of their physical properties to the crop to be grown is a

wise one. Nevertheless good tilth with good water conditions, aeration, and temperature, as well as an adequate supply of plant food, which are so essential to productiveness, may be modified and improved to a marked extent by proper management, culture, and fertilizing, and with the improved physical conditions the chemical processes of the soil come effectively into play.

Texture and Structure of Soils.—The productiveness of a soil depends to a considerable extent upon its texture (fineness of particles) and structure (arrangement of particles). These properties determine largely the circulation of water and gases, the solution and retention of plant food, and the growth of roots of plants. Good texture and structure thus enable a poor soil to produce better crops than a more fertile soil of which the texture and structure are not so good. One of the main objects of tillage is to promote better soil texture and structure. These properties are effected to a considerable extent by various fertilizers. For instance, lime has the power of flocculating the soil particles and thus renders soils more porous, while sodium nitrate and many other substances have a tendency to puddle the soil, that is, to keep the particles separate and thus prevent the open floccular structure. Soils containing large amounts of clay and other fine particles are most injured by puddling and hence most benefited by flocculating by means of lime.

Relation of Soils to Water.—The most favorable amount of water for plant growth is stated to be from 40 to 75 per cent of that which the soil is capable of holding when completely saturated. Another important factor to be taken into consideration is that soils vary in the readiness with which they give up water to growing plants when the amount becomes limited. Crops can utilize a larger proportion of the water in open, coarse-grained sandy soils than of that in compact fine-grained clay soils. In other words, plants will suffer from drought on compact clay soils containing a proportion of moisture which would be entirely sufficient for their needs on sandy soils. Thus, while sandy soils have a much smaller total storage capacity for water than clay soils, the available water is more nearly equal in the two cases than would at first be supposed. Sachs found that tobacco plants began to wilt when the water content of sandy soil was reduced to 1.5 per cent, of clay soils to 8 per cent, and of sand and humus to 12.3 per cent.

Water exists in soils in three different states, which may be termed hydrostatic, capillary, and hygroscopic. Hydrostatic water is that which fills the soil spaces and would drain away if given opportunity. Its upper surface stands at a certain level, which is known as the *water table.* Capillary water is that which is capable of rising in the soil or moving from a more moist to a less moist part of the soil under the influence of sur-

face tension without regard to the force of gravity. Hygroscopic water is that which closely surrounds the soil particles, but is not affected by gravity and does not move through the soil under the influence of surface tension. Capillary water is often drawn from the hydrostatic supply and is the most important from the standpoint of plant growth. Hygroscopic water is not of great value to vegetation. Heinrich found that plants begin to wilt before the water content of soils is reduced to the hygroscopic limit. Under ordinary conditions moisture is constantly escaping from the soil by evaporation. Evaporation may be reduced by tillage and mulching which interfere with the capillary rise of moisture in the soil, and by the use of wind-breaks which lessen the drying effect of winds. The belief is common that the moisture conditions of soils may be materially modified by the use of fertilizers, more especially by the application of common salt, but careful observations and experiments on this point have failed to show any decided effect in increasing the water content of soils by ordinary applications of salt and similar substances.

Exhaustion, Improvement, and Reclamation of Soils.—Soils are said to be exhausted when they no longer yield profitable crops, but strictly speaking there is no such thing as absolute exhaustion of soils. Whitney and Cameron maintain 'that practically all soils contain sufficient plant food for good crop yields (and) that this supply will be indefinitely maintained.' The commonly accepted view, however, is that decline in productiveness is due both to a loss of fertilizing constituents from the soil and to deterioration in its physical condition.

Among the principal causes of loss of soil fertility are (1) the growth and removal of crops without restoring the equivalent of the fertilizing constituents they contain; (2) surface washing, and (3) leaching. All crops contain a considerable amount of fertilizing matter drawn from the soil, and it is held that if these crops are grown continuously and sold away from the farm without return of an equivalent in manure or fertilizers the soil will in time show a decline in fertility. The harmful effects of surface washing is a matter of common observation and needs no further discussion here. The loss of fertility in the drainage water is generally supposed to be very considerable, and under certain circumstances this is true, depending upon the character of the soil and the treatment to which it is subjected and the fertilizers applied. 'Leachy' soils part very quickly with the fertilizing materials applied to them unless covered with crops which utilize the fertilizers promptly, and, as already shown, certain fertilizers have a tendency to set some of the soil constituents free and throw them into the drainage water.

While these are all possible sources of loss, it is probably safe to say that under ordinary conditions the chances of loss of any considerable amount of lime, potash, or phosphoric acid in the drainage water of soils are very small. As regards the loss of the important and expensive fertilizing constituent, nitrogen, however, the case is very different. The soil appears to have very little affinity for the form of this element most commonly used as a fertilizer, namely, nitrate of soda, and if it is not quickly taken up by the crop it is likely to pass into the drainage and be lost. Moreover, other less soluble forms of nitrogen are under favorable conditions rapidly converted into nitrates by the process of nitrification and so may also be lost in the drainage. Dehérain has reported experiments in which the loss of nitric nitrogen in the drainage from a bare soil in the course of a year was nearly 180 pounds per acre, while the loss from a soil which was kept covered by a crop was almost insignificant, although fully as large an amount of nitrates was formed in the latter case as in the former. Unproductiveness due to physical condition may be corrected by a variety of means, including drainage, irrigation, tillage, and by a judicious system of cropping and the proper use of fertilizers.

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SOILING: the practice of feeding green crops fresh from the field to farm stock, either as an amendment to pasture, or as a substitute for it. It has attained its highest development on the dairy farm, and is worthy of extension to other branches of stock-husbandry. During the 18th century it was a common practice in Flanders and was discussed by the agricultural writers and experimenters of that day; and also in 1820 Josiah Quincy directed American attention to the subject in a series of essays printed in *The Massachusetts Agricultural Journal,* which were later issued as a book entitled *The Soiling of Cattle.* Arthur Young, with other writers, pointed out the following advantages from soiling: The saving of land and fencing; the economizing

of food and greater comfort and better condition of the cattle; greater production of milk, and the acquirement of manure. Henry, of Wisconsin, has shown that one acre of soiling crop equals about two and a half acres of good blue-grass pasture for feeding dairy cows. It is no longer debatable whether or not soiling is profitable under most conditions. Abundant testimony is forthcoming to show its advantages and the gain to be derived from even partial soiling as an amendment to pasture. The question whether soiling should be substituted entirely for grazing must be decided by the circumstances involved. On rocky hill-pastures of low value, grazing cannot be discarded, while on high-priced, easily-tilled land, near markets, and where labor can be obtained, the soiling system has a place.

NEW JERSEY SCHEME.

Species of crop.	Time of seeding.	Approximate time of feeding.
Winter Rye	September	May 1-10
Winter Wheat	September	May 10-20
Crimson Clover	September	May 20-June 1
Oats and Peas	April 1	June 1-10
Oats and Peas	April 10	June 10-20
Mixes Grasses	September	June 20-30
Oats and Peas	May 10	July 1-10
Cowpeas	May 20	July 10-20
Corn	June 1	July 20-Aug. 1
Japanese Millet	June 20	Aug. 1-10
Cowpeas	June 10	Aug. 10-20
Corn	June 20	Aug. 20-Sept. 1
Soy Beans	July 10	Sept. 1-10
Japanese Millet	July 20	Sept. 10-20
Corn	July 1	Sept. 20-Oct. 10
Barley and Peas	August 10	Oct. 10-20
Barley and Peas	August 20	Oct. 20-30

In the soiling system it is essential to have a succession of crops, and in selecting these due consideration must be given to the number of animals to be fed, the time when the crops will be needed, and the number of days required for their development. For partial soiling in the summer, alfalfa and two plantings of corn, with sowings of peas and oats at intervals, will furnish abundant feed. Where complete soiling is pursued, some such succession of crops must be grown as outlined by Phelps for Connecticut, Voorhees for New Jersey, and Lindsay for Massachusetts.

For the southern and western states this scheme could be modified. A good rotation of crops should be arranged so that two or three crops may be grown on the same land during one year. Alfalfa should be grown wherever possible, as it can be cut from May to September, and is relished by all stock, while the expenditure for labor is at a minimum. Corn gives a large yield at comparatively little cost. Two serious factors in the complete soiling system are that the labor bill is high where land is continuously under tillage, and that the crop producing power of the soil is speedily reduced unless it is maintained by abundant manuring or fertilizing.

Consult: Phelps, Bulletins 8, 9, Storrs Agr. Exp. Sta., Connecticut; Lindsey, Bulletin 39, Hatch Agr. Exp. Sta., Massachusetts; Henry, Report for 1885, Agr. Exp. Sta. of Wisconsin; Armsby, Report for 1889, Agr. Exp. Sta. of Pennsylvania; Wilson, Bulletin 15, Agr. Exp. Sta. of Iowa; Voorhees, *Fertilizers* (New York 1900); Henry, *Feeds and Feeding* (Madison, Wis., 1900); Jordan, *Feeding of Animals* (New York 1901); Peer, *Soiling, Soiling Crops, and Ensilage* (Ithaca, N. Y., 1903).

SOIRÉE, n. *swaw-rā'* [F. *soirée,* evening—from F. *soir,* evening—from L. *sērus,* late: It. *sera,* evening]: an evening-party for conversation; a public meeting in the evening at which refreshments are distributed. SOIRÉE MUSICALE, *mū'zĭ-kâl'* [F.]: an evening entertainment of music.

SOISSONS, *swâ-sōng':* town of France, department of Aisne, in a fertile vale on the river Aisne, about 65 m. n.e. of Paris: it is a station on three railroads, the Paris and Laon, Compiègne and Soissons and Reims and Soissons. Soissons is the key of Paris for an army invading France from the Netherlands, and is the meeting-point of six military roads. The principal building is the cathedral, founded in the 12th century, whose library contains many rare MSS. There are also some remains of the great castellated abbey of St. Jean des Vignes (founded 1076), where Thomas à Becket found refuge in exile. Quite near Soissons is an institute for deaf and dumb, on the site of the famous abbey of St. Médard, where Clothaire and Siegbert were buried. The chief secular buildings are a museum of antiquities and a public library, with 30,000 volumes; besides a college and two seminaries, and a hospital. There are interesting Roman antiquities, including the ruins of a large amphitheatre, coins, mosaics, sculptures, and vases. Soissons has manufactures of linen, woolens, and cottons. Soissons is one of the oldest towns in France, famous even in the time of the Romans, when it bore the names first of *Noviodunum,* afterward of *Augusta Suessionum:* hence its modern name. It was the last Roman stronghold in Gaul that withstood the arms of Clovis, who here overthrew Syagrius, the Roman commander, 486, and made it the seat of the Frankish monarchy, which it long continued to be. Pop. 10,568.

SOJOURN, v. *sō'jėrn* [F. *séjourner;* It. *soggiornare;* OF. *sojorner,* to sojourn—from a supposed mid. L. *subdiurnārĕ,* to wait over the day—from L. *sub,* under, and *diurnus,* daily—from *dĭēs,* a day]: to dwell for a time; to tarry; to abide: N. a temporary residence. SO'JOURNING, imp.: N. the act of dwelling in a place for a time. SO'JOURNED, pp. *-jėrnd.* SO'JOURNER, n. *-ėr,* one who sojourns or dwells in a place for a time; a temporary resident.

SOJOURNER TRUTH, *sō-jèrn'ér trôth* (original name, ISABELLA): colored woman, a lecturer and reformer: about 1775–1883, Nov. 26; born in slavery in Ulster co., N. Y. The N. Y. emancipation act 1817, freeing all slaves over 40 years of age, freed her, but she did not gain her liberty until 1827. In 1851 she began lecturing on slavery in w. New York, and afterward lectured on politics, temperance, and women's rights in other states. She could neither read nor write, but was well informed on many subjects, and had a naturally ready wit and a gift of pointed expression. She called herself Sojourner, claiming to have heard this name whispered to her by the Lord; and to this name she added that of Truth. She acquired considerable property. She died at Battle Creek, Mich.

SOKE: see SOC.

SOKOTO, *sō-kō'tō:* kingdom of Africa, in Sudan, s.w. of Lake Tchad, and separated from it by the state of Bornu (q.v.); 117,000 sq. m. The inhabitants, mostly of the Haussa race, are numerous. A formidable military force is maintained.—*Sokoto,* former cap., stands on the Zirmie, affluent of the Sokoto which flows into the Quorra; pop. 20,000—22,000. S. trades in raw silk, glass-wares, and perfumery, and has extensive and famous manufactures of leather goods.—The present cap. is Wurno (pop. 12,000), with active trade: it is the residence of the sultan of S., and is a few m. n.e. of Sokoto.

SOL, n. *sŏl* [L. *sol,* the sun]: an old term in emblazoning arms, equal to *or,* or gold; the sun with a human face surrounded with rays; an old term for gold.

SOL, *sŏl:* silver coin in Peru: see SOLIDUS.

SOL, *sōl:* in *music,* the fifth note of the diatonic scale = G. SOL-FA, v. *sōl-fä',* to sing or vocalize the diatonic scale to the syllables *do, re, mi, fa, sol, la, si;* to sing, as a learner, a musical composition with these syllables. SOL-FA'ING, imp. *-ĭng:* N. the act or practice of singing the diatonic scale, or a musical composition to the syllables *do, re, mi, fa, sol, la, si.* SOL-FAED', pp. *-fäd'.*—See SOLFEGGIO: TONIC SOL-FA.

SOLACE, n. *sŏl'ās* [OF. *solaz,* solace—from L. *solātĭum,* a soothing, solace—from *solor,* I comfort: It. *solazzo*]: that which cheers, comforts, or consoles; that which alleviates grief or anxiety; that which relieves in distress; recreation; amusement; in *OE.,* happiness: V. to cheer; to comfort; to console; to relieve in affliction; to soothe; to allay; in *OE.,* to take comfort. SOL'ACING, imp. SOL'ACED, pp. *ās'd,* cheered in affliction. SOL'ACEMENT, n. *-mĕnt,* the act of solacing; comfort.—SYN. of 'solace, v.': to cheer; animate; encourage; enliven; exhilarate; comfort; console; assuage; allay; alleviate; relieve.

SOLANACEÆ, *sŏl-ā-nā'sē-ē,* or SOLANEÆ, *sō-lā'nē-ē:* natural order of exogenous plants, mostly herbaceous plants and shrubs, but including a few tropical trees. The leaves are mostly alternate, undivided or lobed, without stipules. The flowers are regular, or nearly so; the calyx and corolla

generally 5-cleft; the stamens generally five. The fruit is either a capsule or a berry, mostly 2-celled. Most of the plants of this order are natives of tropical countries, a small number extending into the temperate and moderately cold climates of both hemispheres; in the coldest regions they are entirely lacking. They are mostly distinguished by an offensive smell, and by containing in greater or less abundance a narcotic, poisonous substance, usually associated with a pungent principle; and some are among the most active poisons. Sometimes the narcotic substance predominates, as in Mandrake (q.v.) and Henbane (q.v.); sometimes the pungent substance predominates, or is alone present, as in Cayenne Pepper (*Capsicum*); sometimes both are present in more or less proportion, as in Tobacco, Thorn-apple or Stramonium, and Belladonna. The fruit is generally poisonous; but that of a considerable number of species, in which acids and mucilage predominate, is eatable; e.g., the berries of the Winter Cherry and other species of Physalis, those of the Egg-plant (q.v.) and some other species of *Solanum*, and of the Love-apple (*Lycopersicum*). The tubers, which occur in a few species, contain much starch, and serve as food, of which the Potato (q.v.) is the chief example (see SOLANUM). The seeds of all contain a fixed oil, which in s. Germany is expressed from the seeds of the Belladonna itself.

SOLANDER, n. *sō-lăn'dĕr* [F. *solandre*]: a disease in horses.

SOLAN-GOOSE, n. *sō'lăn-gōs*, or SOLAND, n. *sō'lănd* [Icel. *sula*, a solan-goose]: web-footed sea-fowl, found on parts of the coasts of Great Britain and Ireland, etc.; the Gannet (q.v.).

SOLANO, n. *sō-lā'nō* [Sp. *solano*—from L. *sol*, the sun]: hot s.e. wind which occasionally visits the Spanish peninsula, from the direction of the African deserts, extremely hot and loaded with fine dust: see SIMOOM.

SOLANUM, n. *sō-lā'nŭm* [L. *solānum*, nightshade: It. *solano:* F. *solanum*]: the nightshade; systematic name of several plants, of which some are edible, as the potato, and others poisonous—of ord. *Solanāceæ* (q.v.). SOLANINE, n. *sŏl'ă-nĭn*, highly poisonous substance obtained from several species of solanum—called also SOLANI'A, n. *-nī'ă*. SOL'ANA'CEOUS, a. *-nā'shŭs*, belonging to the order of plants which includes the nightshade and the potato.—*Solanum* is a genus containing a great number of species, distributed all over the world, but abundant particularly in S. America and the W. Indies. Some species are herbaceous, others are shrubs; some unarmed, some spiny; many covered with a down of star-like hairs. The flowers are in false umbels, or almost in panicles; seldom in racemes, or solitary. The anthers open by two holes at the top. The berries are two-celled, and contain many smooth seeds. The species of this genus almost always contain in all their parts a poisonous alkaloid, *Solanine*, in greater or less quantity, sometimes so much that the leaves or the berries cannot be eaten without danger, while in a

few species the quantity present is insignificant, and these parts are eaten freely, being agreeable and harmless. By far the most important of all the species is *S. tuberosum*, the POTATO (q.v.), in which, however, Solanine is found in considerable quantity, so that not only the herbage, but the juice of the raw tubers, is unwholesome. Of the species with eatable fruit, the principal is *S. melongena*, the EGG-PLANT (q.v.).—The species *S. dulcamara*, the BITTERSWEET (q.v.), and *S. nigrum*, the COMMON NIGHTSHADE (q.v.), both possess poisonous and medicinal qualities. The berries, leaves, bark, and roots of various species are employed for different medicinal uses in the warm countries of which they are natives; but their properties have not yet been sufficiently investigated. The berries of *S. saponaceum* are used as a substitute for soap.

SOLAR, a. *sō'lér* [F. *solaire*—from L. *solāris*, belonging to the sun—from *sol*, the sun]: pertaining to the sun, or proceeding from it; measured by the apparent revolution of the sun; sunny, in *anat.*, having branches of filaments like the rays of the sun: N. upper chamber or loft; usually the only private apartment in ancient baronial halls—placed over the pantry at one end of the hall, and used as parlor and sleeping-room for the baron and his family. SOLARIZATION, n. *sō'lér-ī-zā'shŭn*, injurious effects of too long exposure to the sun's rays, as to a photograph; excessive insulation. SOLAR CYCLE (see CYCLE OF THE SUN, under CYCLE: also PERIOD). SOLAR DAY, SOLAR MONTH, portions of time marked by the apparent motion of the sun (see CALENDAR: DAY: MONTH: YEAR. SOLAR FLOWERS, flowers that open and close at particular hours of each day. SOLAR PLEXUS, in *anat.*, great plexus of sympathetic nerves supplying the intestines. SOLAR SPOTS, dark spots that appear on the sun's disk when viewed through a telescope. SOLAR YEAR, the space of time measured by a complete revolution of the earth round the sun, being 365 d., 5 h., 48 m., 51·6 s.

SO'LAR MI'CROSCOPE: instrument for producing magnified images of minute objects on a screen, through the agency of the sun's rays (see MICROSCOPE). The tube of the microscope is conical, and is fastened to the interior side of a closed window-shutter over a hole in the latter; a reflector placed at the hole so that the rays of light may fall on it is so adjusted as to throw them along the tube. They are then collected by a powerful double convex lens, and thrown on the object, which is inserted into the tube at the focus of the lens by a slit at the side. After passing the object, the rays again pass through a single lens, or a combination of lenses, make their exit from the tube, and fall on a screen, on which they depict a magnified image of the object. We have here supposed the object to be so translucent as to allow the passage of rays through it. Should it be opaque, the rays of light reflected from the mirror are caught by the double convex lens, which concentrates them on another mirror near the opposite end of the tube; they are thence reflected on the back of the object and diverge on the system of lenses at the mouth,

which form the image. Instead of the sun's rays, the oxyhydrogen lime-light (and recently the electric light) has been employed, its rays being thrown on the double convex condenser by a concave reflector, in whose focus the light is situated. The instrument is hence often called the *Oxyhydrogen Microscope.*

SO'LAR MO'TOR: apparatus for utilizing the sun's rays in producing motion. Various attempts have been made to utilize the radiant energy of the sun; notably by Ericsson, Teller, and Mouchot. Mouchot's motor is based on the use of a large conical mirror which by proper machinery (heliosta) is made continually to face the sun. In the axis of the conical mirror a blackened tubular boiler was placed. Silver-plated copper was the material of the mirror. The sun's rays concentrated on the tubes raised the temperature of the water above the boiling-point. The tubes were jacketed with glass to retain the heat. About 1¼ hours were required to attain the boiling-point; after that 8 minutes under favorable conditions would raise the pressure 15 lbs. per sq. in. As high pressure as 7 or 8 atmospheres were attained; and it is recorded that a steam-pump was worked by it, lifting 46,000 gallons of water per hour for a short time with a steam-pressure of 3 atmospheres. The conical mirror in this case had an opening of about 16 ft. in diameter. Ericsson proposed a glass mirror forming a portion of a parabolic cylinder, made up of strips of silvered glass. At the focal point was a cylindrical heater or boiler. Ericsson up to the last period of his life maintained his faith in the solar motor. In summer-time in New York latitudes he claimed that the sun acting on a surface of 100 sq.ft. developed 1,850,000 foot-pounds of mechanical energy. He had great faith in the applicability of his invention to working irrigating pumps in the clear atmosphere of the west. and for a number of years, several motors were in operation for this purpose in southern California. Ericsson drove a steam-engine, with 6-inch piston and 8-inch stroke, at 120 revolutions per minute with steam at 35 lbs. per sq.in. The trough, as he termed the mirror, was 11 ft. long and 16 ft. wide, with a 12-inch-wide opening in its center directly back of the boiler.

SO'LAR SYS'TEM: the sun, and the planets, comets, and meteoric rings revolving round the sun, viewed in their mutual relations: called sometimes the Planetary System. It is possible that other stars are at the center of an analogous system: this, however, is merely a speculation. No change of much magnitude can take place in the elements of the planets without having effect on the earth and its inhabitants, on account of the mutual attractions of the planets for each other; in fact, they appear as members of one family, bound together by common ties, which could not be ruptured in the case of one individual without general shock to the others. For

the various members of the solar system, see PLANETS; PLANETOIDS; COMET; SUN; MOON; SATELLITES; METEORS. For their motions, see GRAVITATION; CENTRAL FORCES; PRECESSION; ETC. It remains here only to give the more interesting numerical facts connected with the planets.

Planet	Dist. from Sun			Time of Revolution round the Sun	Equatorial Diameter	Volume, Earth's = 1	Density, Earth's = 1
	Mean	Greatest	Least				
	Miles	Miles	Miles	Mean Solar Days	Miles		
Mercury	36,000,000	134,800,000	50,900,000	87.9693	3,000	0.052	1.173
Venus	67,200,000	161,200,000	24,500,000	224.7008	7,700	0.975	0.807
The Earth	92,900,000	.....	.....	365.2524	7,927	1.000	1.000
Mars	141,500,000	248,600,000	34,500,000	686.9796	4,230	0.147	0.711
Jupiter	483,000,000	599,500,000	367,200,000	4332.5882	88,200	1279.412	0.242
Saturn	886,100,000	1,027,200,000	745,100,000	10759.2364	75,000	718.823	0.128
Uranus	1,782,000,000	1,956,900,000	1,607,300,000	30688.3904	32,000	69.237	0.195
Neptune	2,792,000,000	2,909,100,000	2,675,000,000	60181.1132	35,000	54.955	0.300

SOLATIUM, *sō-lā'shĭ-ŭm* [L., consolation]: in Scotch law, compensation for wounded feelings, something over the ordinary pecuniary value of the damage. In the general common law such a ground of damages is not in strict principle admitted, but in practice there is no substantial difference.

SOLD, n. *sōld* [F. *solde* —from L. *solĭdus*, a gold coin]: in *OE.*, military pay; warlike entertainment.

SOLD, v. *sōld:* pt. pp. of SELL. SOLD-NOTE, a note or memorandum of sale given by the seller to the buyer.

SOLDAN, n. *sŏl'dăn: OE.* for SULTAN.

SOLDER, n. *sŏd'ėr* or *sŏl'dėr* [OF. *souder* or *soulder*, to consolidate, to close or fasten together—from L. *solidārĕ*, to make firm—from *solĭdus*, firm: It. *saldo*, solid, firm]: metallic composition for uniting or cementing metals; fusible alloy. Solders are of various kinds suited to different metals. They always require to be used with a flux, such as borax, resin, chloride of zinc, sal-ammoniac, etc. The following are the principal solders: *Pewterer's S.*—bismuth, 2 parts; lead, 4 parts; tin, 3 parts: this can be used for coarse work by direct application of naked fire; but for fine work, requiring the protection of a muffle-furnace, the composition must be bismuth and lead, of each 1 part; tin, 2 parts. *Plumbers' S.* for coarse work—tin, 1 part; lead, 3 parts. For

finer work—tin, 2 parts; lead, 1 part. *Spelter S.*—12 parts of zinc to 16 parts of copper. *Soft Spelter S.*—equal parts of copper and zinc. When solder is applied in the common work of plumbers and tinmen, a tool called the soldering-iron is used: this is made red-hot and forms a convenient means of applying fire direct to the solder and flux. Although called the soldering-iron, the portion of the tool to be heated must be copper. In many manufactures, a flame produced by a mixture of atmospheric air and coal gas is used to melt the solder; and for fine work, such as jewelry, the common blowpipe is often used. SOLDER, v. to unite metals by the fusion of a metallic cement; to mend; to unite anything broken. SOL'DERING, imp.: N. the process of uniting metals by fusing a metallic composition. SOL'DERED, pp. *-dėrd,* united or cemented by a metallic composition. SOL'DERER, n. *-ėr-ėr,* one who or that which solders. HARD SOLDER, solder which only fuses at a red heat. SOFT SOLDER, a solder which fuses at a comparatively low heat.

SOLDIER, n. *sōl'jėr* [OF. *souldart;* F. *soldat;* It. *soldato,* a soldier; It. *soldo;* F. *solde,* pay; hire: L. *solĭdus* or *soldus,* a gold coin]: man engaged in military service; a warrior; one engaged in war; a private. SOL'DIERLY, a. *-lĭ,* or SOLDIER-LIKE, a. becoming a real soldier; brave. SOLDIER-SHIP, n. martial skill; military qualities or character; conduct becoming a soldier. SOL'DIERING, n. *-ĭng.* the state of being a soldier; the occupation of a soldier. SOL'DIERY, n. *-ĭ,* soldiers collectively; the body of military men. SOLDIER-CRAB, a crustacean which, having part of its body unprotected, occupies the empty shell of a shell-fish; the hermit-crab.—A *soldier* is one who enters into an obligation of military service to some chieftain or government to devote for a specified period his whole energies, and if necessary his life itself, to that service, for furtherance of the policy of that chief or government. The consideration may be immediate pay, or prospective reward; or the soldier's contract may be merely an act of loyal devotion. The acknowledgment of the service by the employer constitutes the man a soldier, and empowers him to take life in open warfare, without being liable to the penalties of an assassin and a robber. The fact of being mercenary, that is, of receiving wages for killing and being killed, does not render a soldier's trade less honorable. He bears arms that others may be protected, or may not be compelled to fight: he is precluded by the exigences of military training from maintaining himself by peaceful occupation; it is therefore but fair that those whom he protects should support him, and give him beside actual maintenance, reasonable wages for the continual risk of his health and life. If a man willingly enlist himself as a soldier in what he believes an unrighteous cause, it is an act of moral turpitude; but once enlisted his service can be demanded and enforced by his employer.

SOLDIERS' HOMES: institutions, either national or state, as asylum, temporary or permanent, for invalid or disabled soldiers of the United States. An act of congress, 1851, Mar. 3, provided for a model Soldiers' Home, near Washington, on a site of 200 acres, since extended to 500 acres, and constituting a beautiful park, with spacious marble buildings worthy of the national capitol. The funds used came from the city of Mexico, being the tribute levied by Gen. Scott at the close of the Mexican war, with some other moneys appropriated by congress. Those entitled to the benefits of the Home at Washington are: 1, soldiers of 20 years' service; 2, those invalid or disabled in consequence of service; 3, pensioners who surrender their pensions. Good character is a condition of admission, and on recovery of health any inmate is discharged. A board of commissioners, made up of officers of the highest rank, controls the administration of the Home, through a gov. of the Home, who is one of their number. The inmates, 1890, numbered about 1,200, besides about 250 temporary inmates. The expenses are about $200,000 a year.

The number of veterans of the civil war (in which were called out 2,778,304 men for military service) has required an extended system providing asylum for invalid and disabled volunteers. A National Soldiers' Home was established by act of congress, 1865, and its system further developed 1873. To meet the wants of all parts of the country the institution has been planted at various points; viz., Dayton, O., Togus, Me., Milwaukee, Wis., Leavenworth, Kan., Hampton, Va., Santa Monica, Cal., and Marion, Ind.

The action of the national govt., providing these S. H., has been supplemented by many state Homes. That of N. J. at Kearney was the first, the state having authorized it by act 1865, Mar. 23. It has nine buildings, and nearly 300 inmates. That of N Y., incorporated 1863, but not constructed until 1877–79, has 30 attractive buildings, and accommodates over 1,000 inmates, at a cost for ten years of $1,130,861. It is at Bath, Steuben co. In Penn. the Home, at Erie, is a building covering an area 370 ft. sq., with capacity for 600 persons. It was opened 1886, Feb. 3. The Home at Sandusky, O., established 1886, with capacity for 700, has 18 buildings and about 500 inmates. The Home of Ill., at Quincy, has a grand central building, 17 cottages, and several other buildings, with room for 900, and about 600 present, 1890. It was organized 1885. At Grand Rapids, Mich., the Soldiers' Home, organized 1885, has a single very large and elaborate building, with capacity for 400 inmates. The Home of Wis., at Waupaca, established 1887, has a group of cottages, where over 50 men, some with wives, and a number of soldiers' widows, are provided for. At Yountville, Cal.; Grand Island, Neb.; Hot Springs, S. Dak.; Fort Dodge, Kan.; Minnehaha Falls, Minn.; Tilton, N. H.; Noroton, Conn.; Bennington, Vt.; Chelsea, Mass.; and Bristol, R. I., are other state Homes, amply organized and liberally maintained.

SOL'DO: see SOLIDUS.

SOLE. n. *sōl* [F. *sole;* Ger. *sohle;* Sw. *sola;* L. *sŏlĕa*, the sole of the foot or of a shoe: W. *sail*, foundation, groundwork; Gael. *sail*, a beam of wood: L. *solum*, the ground or earth]: the bottom of the foot or of a shoe; the part of a thing which forms the bottom: a certain flat sea-fish (see below): the bottom or lowest part of an embrasure: V. to furnish with a sole. SOL'ING, imp. SOLED, pp. *sōld*. SOLE-LEATHER, the thick leather to form soles to shoes. SOLE-SHOE, the long bottom part of the plow which supports its weight upon the ground at the bottom of the furrow, and which serves as a slide.

SOLE, a. *sōl* [OF. *sol;* F. *seul*—from L. *solus*, alone]: single; individual; being or acting without another; alone; only; solitary. SOLE'LY, ad. *-lĭ*. SOLE'NESS, n. *-nĕs*, the state of being alone. FEMME SOLE, in *law*, an unmarried woman.

SOLE (*Solea*): genus of Flat-fishes (*Soleidæ*), of oblong form, with rounded muzzle, which almost always advances beyond the mouth; the mouth twisted to the side opposite to that on which are the eyes—the eyes being usually on the right side, though individuals of the same species are found having the eyes and color on the left; the teeth very small, in both jaws, but only in the under part of the mouth (the *side* opposite to the eyes); the lateral line straight; pectoral fins on both sides; the dorsal and anal fins long, and extending to the tail, but distinct from the tail-fin.—The COMMON S. (*S. vulgaris*) is a highly esteemed fish, abundant on the British coasts where the bottom is sandy, and of which great quantities are brought to market. They are caught by trawling, seldom with bait. The S. is in condition for the table during the whole year except five or six weeks in Feb. and Mar., its spawning-time. The Common S. is found on all coasts of Europe, except the most northern. It has been known to attain 26 inches length, and almost 12 inches width, weighing 9 lbs.; but a S. less than half that weight is reckoned very large. The upper size of the body is of almost uniform dark brown; the scales small, rough to the touch, and ciliated at the edge; the lower side is white. The S. sometimes ascends rivers to a considerable distance from the sea, and seems to thrive as well in fresh as in salt water. It breeds freely enough in fresh water.—The LEMON S. (*S. pegusa*), less frequently taken, is equally esteemed for the table.—The name S. is popularly extended to several genera which have been separated from the true soles. In *Brachirus*, the dorsal and anal fins are united with the tail fin; but, as in *Solea*, there are pectorals on both sides: to this genus belongs the ZEBRA S. (*B. zebrinus*) of Japan.—In *Monochirus*, the pectoral fin is developed only on the upper side: to this genus belong the VARIEGATED S. (*M. variegatus*) and the LITTLE S. or SOLENETTE (*M. linguatulus*); both small. In genera *Achirus* and *Plagusia*, the pectorals are lacking on both sides.

On the Pacific coast of N. America, the name S. is given to various species of the family *Pleuronectidæ*, the common

market species being *Lepidopsetta bilineata*, averaging 3 lbs. The New York Sole (*Achirus mollis*), of the same family, is irregularly banded, and only 6–8 in. long.

SOLEAFORM, a. *sŏl-ē'ā-fawrm* [L. *sŏlĕa*, a sandal; *forma*, shape]: in *bot.*, slipper-shaped.

SOLECISM, n. *sŏl'ĕ-sĭzm* [Gr. *soloikis'mos*, any incongruity of language; said to be from *Soli*, town in Cilicia, whose Greek inhabitants corrupted the Greek language and used a mixed dialect]: any glaring deviation from the established usage of a language in speaking or writing; any impropriety or barbarism of speech extending beyond single words; any absurdity or impropriety. SOL'ECIST, n. *-sĭst*, one guilty of an impropriety in language. SOL'ECIS'TIC, a. *-tĭk*, or SOL'ECIS'TICAL, a. *-tĭ-kăl*, incorrect or incongruous in language. SOL'ECIS'TICALLY, ad. *-lĭ*. SOL'ECIZE, v. *-sīz*, to commit a solecism. SOL'ECIZING, imp. SOL'ECIZED, pp. *-sīzd*.

SOLEMN, a. *sŏl'ĕm* [L. *solennis*, or *solemnis*, religious, solemn: Sp. *solemne;* F. *solennel;* It. *solenne*, solemn]: marked with religious gravity or pomp; affecting with seriousness; attended with religious rites; adapted to impress seriousness or reverence; having the appearance of seriousness or gravity; serious; reverential; devotional; sacred, as an oath. SOL'EMNESS, n. *-nĕs*, the state or quality of being solemn; reverential manner. SOL'EMNLY, ad. *-lĭ*, in a solemn, grave, or stately manner; with religious ceremonies; with due state or form. SOLEMNITY, n. *sŏ-lĕm'nĭ-tĭ*, an impressive religious ceremony; manner of acting adapted to impress awe; impressiveness; gravity; steady seriousness. SOLEMNIZE, v. *sŏl'ĕm-nīz*, to celebrate or perform with religious ceremonies; to perform religiously at stated times; to render or make serious or reverential. SOL'EMNIZING, imp. SOL'EMNIZED, pp. *-nīzd*. SOL'EMNIZER, n. *-nī zĕr*, one who solemnizes. SOL'EMNIZA'TION, n. *-nĭ-zā'shŭn*, the act of solemnizing; celebration. SOLEMN-BREATHING, a. diffusing solemnity; impressing with seriousness. SOLEMN LEAGUE AND COVENANT, in *Scot. hist.*, written bond of confederacy entered into among the nobility, gentry, burghers, and others for suppression of popery and prelacy, accepted by the Scot. parl. 1638, adopted by Eng. parl. 1643, sworn to by Charles II. before he was crowned by the Scots at Scone, 1651; but after the Restoration it was rejected by Charles II., and ordered by him to be burned by the common hangman (see COVENANTS, THE).—SYN. of 'solemn': grave; serious; sober; reverential; devout; formal; sacred; devotional.

SOLEN, *sō'lĕn:* genus of lamellibranchiate mollusks, type of a family, *Solenidæ*, remarkable for the wide gaping of the shell at both ends, and the large and muscular *foot*. In the genus S., the shell is remarkably elongated, its apparent length being, however, more strictly its breadth. From its form the names RAZOR-SHELL and RAZOR-FISH are often given to it. The species are numerous, and inhabit the sands of all seas except in the coldest parts of the world. Some tropical species have shells of great beauty. The

solens burrow in sand, making their hole straight down, and ascending and descending by means of the foot, which is capable of being elongated and contracted to bore a passage for the animal, and to drag it through. They are used for food, also by fishermen for bait. To obtain them, a hooked iron implement is used. Another method is to drop salt on the mouth of the hole, which causes them to come up, when they are quickly seized. A common species, *S. siliqua,* is about an inch in *length,* and eight inches in breadth: it is perfectly straight. Another species, *S. ensis,* is curved like a sword.

SOLENOID, n. *sō'lĕn-oyd* [Gr. *sōlēn,* a channel, a tube; *eidos,* resemblance]: a continuous copper wire having one part straight, and the other twisted as an open spiral around the straight part, which, when an electric current passes through it, acts as a magnet.

SOLENT, *sō'lĕnt:* w. portion of the strait between the Isle of Wight and the mainland of England. At Hurst Castle, which guards its entrance on the s.w., the Solent is less than a mile wide; and along this narrow passage the tide flows with a rapidity which at certain times no boat can stem. The castle itself consists of a central keep, surrounded by several smaller towers, and mounted with heavy guns.

SOLEURE, *so-lėr'* (Ger. *Solothurn*): canton in n. Switzerland, bounded w. and s. by Alsace and Bern, n. and e. by Basel and Aargau; 300 sq. m. The greater portion of the canton is fertile and well cultivated, especially along the banks of the Aar. Even the rugged and hilly districts are sources of wealth on account of their fine pasturage. Besides grain, the principal products of Soleure are fruit and live-stock. Kirschwasser, a sort of cherry-brandy, is a very important article of trade. Of the people, 43 per cent are engaged in mining and manufacturing industries, chiefly watch-making, machine-construction, metallurgy, paper-making, wool-manufacture, silk-manufacture, and shoe-manufacture. Soleure entered the Swiss Confederation 1481, with Freiburg. Its constitution is liberal. The legislative body is the grand council, consisting of one member for each 650 of population. The members are, since 1856, chosen directly by the people, who have besides a veto on the laws passed by the council. The executive is chosen by the council, and consists of 5 members. Pop. (1901) 100,838.

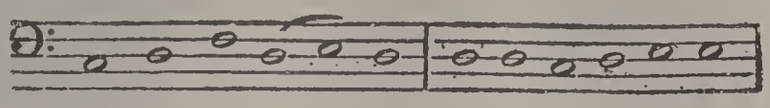
SOLEURE' (Ger. *Solothurn*): city, cap. of the canton of Soleure; on the Aar, 16 m. n.n.e. of Bern by railway. The scenery in its vicinity is among the loveliest in Switzerland. The Aar flows through the town, dividing it into two unequal parts connected by three wooden bridges. The most notable building is the cathedral of St. Ursinus, with cupola and façade of Corinthian columns, reckoned the most costly cathedral in Switzerland. Pop. (1901) 10,116.

SOLEY, *sō'lĭ*, JAMES RUSSELL: author: b. Roxbury, Mass., 1850, Oct. 1. He graduated at Harvard Univ. 1870; was appointed asst. prof. of English at the U. S. Naval Acad. 1871, and prof. of English studies, history, and law; commissioned prof. in the navy 1876; detailed for duty at the Paris exhibition and to investigate the methods of European naval colleges 1878; transferred to Washington to collect and arrange the library of the naval dept. 1882; made supt. of publications of the naval records of the civil war 1883; lecturer on international law at the Naval War College 1885; and asst. sec. of the navy 1890, July 16-1893. His publications include: *History of the Naval Academy* (1876); *Foreign Systems of Naval Education* (1880); *The Blockade and the Cruisers* (1883); *The Rescue of Greely*, in conjunction with Capt. W. S. Schley (1885); *European Neutrality during the Civil War* (1888); and contributions to *The Battles and Leaders of the Civil War* and *The Narrative and Critical History of America.*

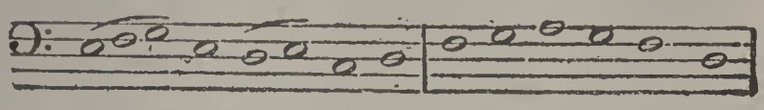
SOL-FA: see SOL 3: SOLFEGGIO.

SOLFATARA, n. *sŏl'fă-tä'rä* [*Solfatara*, volcano near Naples—from It. *solfo*, sulphur, brimstone]: volcanic fissure or vent from which sulphurous vapors, hot mud, and steam are erupted: the most notable are in Italy, in the Antilles, in interior Asia, and in Java. The original S., that of Pozzuoli, near Naples, is an irregular plain, 1,368 ft. long, 1,310 ft. broad, almost surrounded by broken hills of pumaceous tufa, the ancient walls of the crater. From the crevices of the rocks, steam or noxious gases, chiefly sulphuretted hydrogen, mixed with a minute quantity of hydrochloric acid and ammonium chloride, exhale. In the cracks and fissures of the rocks, sulphur, alum, and sulphate of iron abound. The vapors exhaled are used for medicinal baths; and huts of boards have been erected in which the baths may be obtained. The Soufrière of Morne-Garou, in the isle of St. Vincent, Lesser Antilles, about three m. in circuit, and more than 500 ft. deep, has in its centre a cone, whose summit is covered with sulphur. There are solfataras in the Yellowstone National Park, and in Lake co., Cal. SOLFATARITE, n. *sŏl-făt'ăr-īt*, a name applied to the soda-alum found at Solfatara, near Naples.

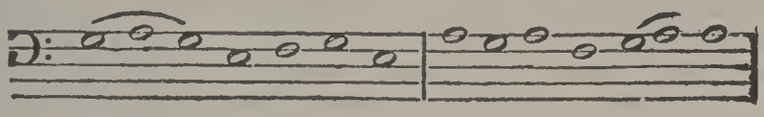
SOLFEGGIO, n. *sŏl-fĕj'ĭ-ō* [It.]: system of marking the notes of the musical scale with syllables instead of the letters C, D, E, F, G, A, B; intended to aid learners to sing at sight. Seven syllables are used in this nomenclature for the seven notes of the scale. In singing, the art of applying these syllables to the notes, as an exercise for the learner, is called *Solmization*. The syllables are *ut* (or *do*), *re, mi, fa, sol, la*, and *si*. The first six are the commencement of the lines of Paulus Diaconus's (8th c.) hymn to John the Baptist, which had this peculiarity, that the first syllable of each line was sung to a note one degree higher than the first syllable of the line that preceded so as to present the type of a scale:



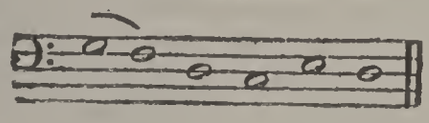
Ut que - ant lax - is *Re* - so - na - re fi - bris



Mi - ra ges - to - rum *Fa* - mu - li tu - o - rum



Sol - ve pol - lu - ti *La* - bi - i re - a - tum



Sanc - te Jo - han - nes.

These syllables are said to have been used first by Guido of Arezzo, 11th c. (see GUIDO ARETINO); and Le Maire, French musician of the 17th c., added to them *si*, for the 7th of the scale. When applied to the key of C, their equivalents, in the ordinary musical nomenclature, are:

Do	re	me	fa	sol	la	si	do
C	D	E	F	G	A	B	C.

These syllables may, however, according to the modern practice of teachers in this country, be applied to other keys, with *do* always as the key-note, so as to express not the absolute pitch of a note, but its relation to the key-note; and thus used, they are thought to be of service to the learner in keeping prominently before him the principle that there is in music but one scale, which is raised or lowered according to the pitch of the key. Variations in the way of using the syllables have recently given rise to short and easy modes of teaching singing, the best known of which is Curwen's system of 'Tonic Solmization,' commonly known as Tonic Sol-fa (q.v.); in which the ordinary notation of the staff, with its lines and spaces, is entirely rejected, and a notation substituted which is formed of the solfeggio syllables, used to express not pitch, but relation to the key-note. One disadvantage urged against this and similar schemes is the entire withdrawal of the direct indication of the pitch of the sounds to the eye, by the notes ascending as the sounds ascend, which is so prominent a feature of the common notation. It is urged also, that even if the rudiments of music can be taken up with remarkable ease by the pupil who learns on the tonic sol-fa system, he

will be beset with difficulties as soon as he comes in contact with notes of different lengths, or begins to modulate from one key to another. The further objection is urged, that the pupil thus taught is shut out from the whole historic world of musical literature: see TONIC SOL-FA.

SOLFERINO, *sōl-fā-rē'nō:* village of n. Italy, province of Mantua, 20 m. n.w. of Mantua. It stands on a hill, and has a tower called the Spy of Italy (*Spia d'Italia*), from which the whole plain of Lombardy can be seen. There, 1796, the French conquered the Austrians. S. was again the scene of a great victory 1859, June 24, by the French and Italians over the Austrians.—Pop. 1,116.

SOLICIT, v. *sŏ-lĭs'ĭt* [F. *solliciter*, to request—from L. *sollĭcĭtārĕ*, to stir up, to urge—from *sollĭcĭtus*, roused, anxious—from *sollus*, whole, entire; *ciĕō*, I excite: It. *sollecitare*]: to ask with some degree of earnestness; to entreat; to invite, as the attention; to try to obtain; to summon; to excite; in *OE.*, to disturb; to disquiet. SOLIC'ITING, imp. SOLIC'ITED, pp. SOLIC'ITANT, n. *-ănt*, one who solicits. SOLIC'ITA'TION, n. *-ĭ-tā'shŭn*, urgent or earnest request; entreaty; importunity; invitation. SOLIC'ITOR, n. *-tĕr*, one who asks with earnestness; one who solicits for another; in *Engl.*, one legally qualified to act for another in courts of law; in *Scot.*, an attorney; in *Amer.*, a counsel who acts as attorney (see ATTORNEYS: LAWYER). SOLIC'ITORSHIP, n. office or rank of a solicitor. SOLICITOR-GENERAL, in the *U. S. federal govt.*, an officer of the dept. of justice. He assists the attorney-gen.—In *England*, the solicitor-general has powers similar to those of the atty.gen. (see under ATTORNEY), whom he aids in his functions: he is in dignity the second law officer of the crown. SOLIC'ITOUS, a. *-tŭs*, careful; apprehensive; uneasy; anxious; eager; very desirous, as to obtain something. SOLIC'ITOUSLY, ad. *-lĭ*. SOLIC'ITUDE, n. *-tūd*, uneasiness of mind; care; trouble; concern; anxiety.—SYN. of 'solicit': to ask; request; beseech; supplicate; entreat; implore; adjure; crave; beg; importune.

SOLIC'ITOR OF THE TREASURY: in the U. S. federal govt., an officer exercising functions in the treasury dept. under the supervision and control of the attorney-gen.: he takes cognizance of infringements of the revenue laws, and is the legal adviser of the sec. of the treasury.—In England, the 'Solicitor to the Treasury' acts as attorney for the govt. in all legal proceedings.—In the U. S. federal govt. there is also a *Solicitor of Internal Revenue* in the treasury department.

SOLID, a. *sŏl'ĭd* [F. *solide*—from L. *solĭdus*, whole, complete, solid: It. *solido*]: hard; firm; compact; impenetrable; not liquid or fluid; not hollow; cubic; healthy; strong; valid; just; not light or superficial: N. a firm compact body; a body not liquid or fluid; in *geom.*, a magnitude having length, breadth, and thickness. SOL'IDLY, ad. *-lĭ*. SOLIDITY, n. *sŏ-lĭd'ĭ-tĭ* [F. *solidité*—L. *soliditas* or *solidĭtātem*]: compactness; density; the quality of bodies which resists impressions; firmness; strength; soundness;

validity; certitude; weightiness. SOL'IDNESS, n. *-nĕs*, the quality of being firm or dense; moral firmness; soundness; validity; weight. SOLIDIFY, v. *sŏ-lĭd'ĭ-fī* [F. *solidifier*, to solidify—from L. *solĭdus*, firm; *facĭō*, I make]: to make solid or compact; to grow solid. SOLID'IFYING, imp. SOLID'IFIED, pp. *-fīd*. SOLID'IFICA'TION, n. *-kā'shŭn*, the state assumed by certain liquid bodies on cooling, or on parting from their heat. THE SOLIDS, as applied to the body, the bones, flesh, etc., as distinguished from the fluids. SOLID ANGLE, an angle made by three or more plane angles meeting in a point, but which are not in the same plane. SOLID MEASURE, a measure in which each of the units is a cube. SOLID SQUARE, a body of troops in the form of a square in which the ranks and files are equal. —SYN. of 'solid, a.': compact; dense; strong; firm; sound; real; true; grave; profound; certain; substantial; hard; valid; just; weighty; important.

SOLIDAGO, n. *sŏl-ĭ-dā'gō* [L. *solido*, I unite, from the vulnerary qualities which have been attributed to some species]: golden-rod, the typical genus of *Solidagineæ*.

SOLIDARITY, n. *sŏl'ĭ-dăr'ĭ-tĭ* [F. *solidarité*, mutual responsibility—from *solide*—from L. *solĭdus*, solid]: an entire union or consolidation of interests and responsibilities; international stability or strength.

SOLIDUNGULATES, n. plu. *sŏl'ĭd-ŭng'gū-lāts*, or SOL'IDUN'GULA, n. plu. *-gū-lâ* [L. *solĭdus*, solid; *ungŭla*, a hoof]: an order of mammals, including the horse and its allies, which have the hoofs whole or undivided: see EQUIDÆ. SOL'IDUN'GULOUS, a. *-lŭs*, or SOL'IDUN'GULAR, a. *-lĕr*, having the hoof entire or not cloven, as in the horse.

Foot and Foot-bones of the Horse, showing the Single Toe.

SOLIDUS, *sŏl'ĭ-dŭs* [L. 'solid']: Roman gold coin issued first in the reign of Constantine, who substituted it for the *aureus* of Augustus. The S. weighed about 70 grains, the aureus (originally) about 120 grains. The S., or 'solidus aureus,' was adopted by the Franks under the Merovingians and Carlovingians (at 87 to the Roman pound) till the time of Pepin, who suppressed it; but another S. of silver, or 'solidus argenteus'—the $\frac{1}{20}$ of the libra or pound—which had been used only as a money of account, was soon afterward made a coin. In after-times, this 'sol,' or 'sou,' like all other coins, underwent endless variations in fineness and value (see LIVRE). On the introduction of the decimal system (1793) into France, the sou was abolished, and a piece of 5 centimes ($\frac{1}{20}$ of a franc) substituted; but the name continued in common use, and the old sous were retained in circulation. The S. appears also in the *soldo*, a coin in use in n. and central Italy, and essentially the same with the sou.—In Peru, the monetary unit is the sol, a silver coin, in value (1891) $0.771. In the abbreviation of l. s. d., the s. stands for 'solidus' (plu. *solidi*), solidus thus standing for 'shilling.'

SOLIFIDIAN, n. *sŏl'ĭ-fĭd'ĭ-ăn* [L. *sōlus,* alone; *fĭdes,* faith]: one who holds that faith alone is necessary to justification: ADJ. pertaining to. SOL'IFID'IANISM, n. *-ĭzm,* the tenets of Solifidians.

SOLILOQUY, n. *sŏ-lĭl'ō-kwĭ* [mid. L. *soliloquĭum,* a soliloquy—from L. *sōlus,* alone; *loquor,* I speak: It. *soliloquio;* F. *soliloque,* a soliloquy]: a talking to one's self; a discourse not addressed to any one, even though others be present; a written composition containing such discourse. SOLIL'OQUIZE, v. *-kwīz,* to utter a soliloquy; to speak to one's self. SOLIL'OQUIZING, imp. SOLIL'OQUIZED, pp. *-kwīzd.*

SOLINGEN, *sō'lĭng-ĕn:* town of Prussia, province of the Rhine, govt. of Düsseldorf; cap. of a circle of the same name, on a height 13 m. e.s.e. of Düsseldorf, and not far from the river Wupper. It is a very old place, and has long been famous for steel and iron ware manufacture, especially sword-blades, helmets, cuirasses, knives, scissors, which are exported to all parts of the world. The chief industries are making sword-blades, knives, scissors, revolvers, etc. 'Damascus' blades, so called, are forged in Solingen. Pop. 45,249.

SOLIPED, n. *sŏl'ĭ-pĕd* [L. *sōlus,* alone; *pes* or *pĕdem,* a foot]: an animal whose foot is not cloven, as the horse. SOLIPEDOUS, a. *sŏ-lĭp'ĕ-dŭs,* or SOLIP'EDAL, a. *-ĕ-dăl,* having single uncloven hoofs.

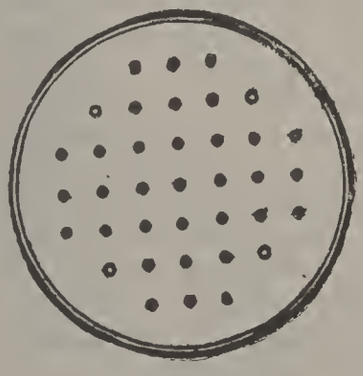
SOLIPSISM, n. *sŏl'ĭp-sĭzm* [L. *solus,* alone, *ipse,* self, and *ism*]: the philosophical theory that the individual knower does not and cannot know whether there exist any other beings than himself. The chief argument for solipsism is that, since I, as an individual, am directly aware of my own ideas or states of consciousness alone, I can have no certain ground for inferring the existence of anything beyond my own ideas. The reply to this argument is that, as a matter of fact, man is self-conscious only in interaction with other selves and with the physical world. The individual self cannot have coherent ideas out of all relation to a knowable world. Consequently, the initial assumption of solipsism, namely that ideas are independent of objective reference, is false. There is no thorough-going system of solipsism to be found in the history of thought. It seems to be logically involved in the scepticism of HUME (q.v.).

SOLITAIRE, *sŏl-ĭ-tär* (*Pezōphaps*): genus of birds of the Dodo (q.v.) family (*Didinæ*), but differing from the dodos in having smaller bill and longer legs. Like the dodos, the only species of this genus, of the existence of which there is any evidence (*P. solitaria*), seems to have become extinct in very recent times. Leguat in his *Voyages et Aventures* describes the solitaire as a very large bird, taller than a turkey, the neck a little longer in proportion, and carried erect; the head of the

male without comb or crest, that of the female with something like a widow's peak above the bill; the wings small, and the bird incapable of flying, but using the wings only to flap itself or to flutter when calling for its mate, or as a weapon of offense or defense—the bone of the wing being thickened at the extremity so as to form a round mass, about the size of a musket-bullet, under the feathers, and to increase the force of the blow given by it; a roundish mass of feathers instead of a tail. Leguat describes the plumage as very full and beautiful, not a feather out of its place, so there can have been no feathers with unconnected webs, as in the ostrich. He says the bird is called S. because it is seldom seen in flocks. He tells us that the bird is with difficulty caught in the forests, but easily on open ground, because it can be outrun by a man; and that its flesh is very good to eat.—But the S. has completely disappeared from Rodriguez, which is now a British settlement. Since Professor Newton's visit to Rodriguez 1865, the skeleton has been entirely reconstructed. Skeletons are preserved in England, in the South Kensington Museum and the Royal College of Surgeons, London, and in the Museum of the Univ. of Cambridge.—The figure here given is derived from a rude cut in Leguat's work.

The name S. was given originally to a species of dodo inhabiting Bourbon, also extinct, of which some remains were found 1866 and transmitted to England: Leguat called the S. 'dodo,' in a mistaken belief of its being the same. See *Strickland and Melville on the Dodo and its Kindred.*

SOLITAIRE': game or rather puzzle, played by only one person. The apparatus consists of a round or octagonal flat board, indented with 33 or 37 hemispherical hollows, as in the figure, and 33 or 37 balls, one in each hollow. The game consists in removing one ball from the board, and then, having created a vacancy, capturing one of the balls adjoining by causing the one behind to leap over it into the vacant hollow; there are now two vacancies, and the game is continued in the same manner by capturing ball after ball, till only one remains, when the game is *won.* Should more than one be left, and they be so isolated as not to be liable to capture by each other, the game is *lost.* This puzzle may be solved in an immense number of ways; one of the prettiest modes consists in removing the central ball, and so capturing the others that the last ball shall be in the centre.—The name S. is applied to various games or processes with cards, played by one person.



Solitaire.

SOLITARY, a. *sŏl'ĭ-tĕr-ĭ* [F. *solitaire*—from L. *solitārĭus*, solitary—from *sōlus*, alone: It. *solitario*]: living alone; lonely; remote from society; not much frequented; gloomy; dismal; occurring singly, as a *solitary* instance: N. one who lives alone; a hermit. SOL'ITARILY, ad. *-lĭ*. SOL'ITARINESS, n. *-nĕs*, state of being alone; retirement; solitude. SOL'ITAIRE', n. *-tär'* [F.]: a hermit; an ornament, set with a single diamond or other gem; game that can be played alone (see above): large extinct bird, like the dodo (see above).—SYN. of 'solitary, a.': sole; single; individual; lonely; desolate; remote; retired; gloomy; still; dismal; separate.

SOLITUDE, n. *sŏl'ĭ-tūd* [F. *solitude*—from L. *solitūdo*, loneliness—from *sōlus*, alone: It. *solitudine*]: loneliness; remoteness from society; retiredness; a lonely place; a desert.

SOLLECITO, ad. *sŏl-lĕch'ē-tō* [It.]: in *mus.*, a direction to perform with care.

SOLLER, *sōl-yär'*: town and seaport of the Balearic Isles, in Majorca, 14 m. n. of Palma. It exports oranges and wine. Pop. 7,000.

SOLMIZATION, n. *sŏl'mĭ-zā'shŭn* [from the vocalizing of the syllables *sol, mi*]: act of sol-faing: see SOLFEGGIO.

SOLNHOFEN LITHOGRAPH'IC STONE, *sōln'hof-ĕn:* deposit of limestone of Upper Oolite age, which from its fine-grained and homogeneous texture is admirably adapted for lithographic purposes. It occurs near Solnhofen in Bavaria, and has been extensively quarried. The quarrymen work on the lines of stratification, which are beautifully parallel, and all the fossils are found on the natural surfaces of the beds, and present an impression and cast in almost every instance. The rock is quarried to a depth of 80–90 ft. It is of special interest to the geologist from the singular assemblage of fossil remains preserved in it with wonderful minuteness. The most delicate tracery of the wings of the dragon-fly is often as perfect as in living specimens. The rock is of marine origin, and while lithologically it has a strong resemblance to the White Lias of Britain, its fossils correlate it to the Kimmeridge Clay. The fossils are chiefly ammonites, nautili, crustacea, winged insects, fishes, and pterodactyles. But the most singular fossil is one discovered 1861: a single feather was first found, and some months later the bones of a feather-covered animal, considered by its first describers a lizard, hence the name first proposed for it, *Gryphosaurus*, i.e., griffin-lizard; but Prof. Owen held it to be a true though very anomalous bird: Huxley makes it the type of the *Saururæ*, the first of his three orders of Birds. The specimen, which is deficient as to head and other important parts, but in other respects is excellently preserved, is now in the Brit. Museum. Prof. Owen named it *Archæopteryx macrura*. It was pronounced the oldest bird of which any remains had yet been found; though the Connecticut valley footprints were supposed to point to a still earlier fowl. These footprints are now by palæontologists

generally attributed to Dinosaurian reptiles. (For the relation of *Archæopteryx* to ancient American birds, see Marsh's *Odontornithes*, monograph on the extinct toothed birds of America.) Another specimen of *Archæopteryx* was found at Solnhofen (1880), and is now in the Royal Museum at Berlin. In this specimen the cervical vertebræ are distinctly seen; the head less distinctly, as also in part the sternal apparatus. In the Brit. Museum specimen (and in the Berlin specimen far more distinctly), at the extremity of each wing is seen a free digit answering to the *pollex*. The *Archæopteryx* was about the size of a rook. The anomalous structure which induced the earlier observers to make it a reptile, and their successors to see in it a transition form between reptile and bird, is the tail, which, instead of consisting of a few shortened vertebræ united into a coccygean bone, as in all known birds, recent or fossil, had 20 elongated vertebræ, each supporting a pair of quill-feathers. But this departure from the bird type is not so anomalous as at first appears; for in the early embryonic condition of birds, the vertebræ are distinct and separate, and the anastomosis which invariably takes place in the subsequent development of the embryo, does not occur in *Archæopteryx*, so that it may be considered to exhibit the temporary embryonic condition of the bird as a permanent structure; and that this is the true position of this singular fossil is further evinced by the existence of other features found only in birds. These are the ornithic structure of the wings and legs, the occurrence of feathers, which are confined to birds, and the existence of a merrythought (furcula), found in no other class of animals.

SOLO, n. *sō'lō*, plu. So'LOS, *-lōz*, or So'LI, *-lē* [It. *solo*—from L. *solus*, alone]: air or strain to be played by a single instrument, or sung by a single voice. The term is used in musical compositions of several parts, vocal or instrumental, to indicate those voices or instruments that are to perform alone or prominently; e.g., *soprano solo, violino solo*. The plural, *soli*, is used when two or more voices or instrumental parts are to be performed together, but never doubled.—A composition for a single instrument accompanied also is termed a solo.

SOLOFRA, *sō-lō'frâ:* small city of s. Italy, province of Avelino: on the Apennines, surrounded by wooded mountains. It has manufactures of leather, cloth, parchment, and jewelry. Pop. 5,160.

SOLOMON, *sŏl'o-mon* (Heb. Shĕlômô, Salomon, Salomo, Suleimán; from *shalom*, peace = Man of Peace): about B.C. 1035—about 975 (reigned prob. B.C. 1015–975); second son of David and Bathsheba; successor of David on the throne of the Israelitish empire. There is discrepancy among investigators about these dates—within a range of about 25 years. Nothing is known of his youth except that he was educated probably by Nathan (or Jehiel). Equally uncertain is the age at which he succeeded to the crown of his father. That he was older than 12 or 14 years, as some traditions tell us, seems certain. His succession to the throne during the lifetime of his father was brought about, to the exclusion of his elder brother Adonijah, David's second and eldest living son, by what has been called a *coup d'état* (see I K. i.). But it was made unavoidably sudden by Adonijah's usurpation of the kingly title in David's enfeebled old age, by which act he made void David's own appointment of S., with solemn oath, to be his successor. S., having acceded to the throne, spared Adonijah and the leaders of his faction, until, later, their imprudent action forfeited their lives. Having secured his dominion against internal foes, he, in entire disregard of the Mosaic law, set himself to seek foreign alliances, and married as his principal wife the daughter of Pharaoh, probably of Psusenes (Vaphres?), of the 21st dynasty. Besides her, however, he had a vast number of wives—700 'princesses,' and 300 'concubines'—the greatest part of whom were recruited from heathen nations with whom an alliance had been strictly prohibited. Having inherited fabulous wealth, and further adding to it enormously from his own multifarious revenues, so that 'silver was nothing accounted of in his days,' it became necessary that a new organization corresponding to this unheard-of splendor should be introduced. Accordingly, we hear of 'Princes,' i.e., great officers of state, not before known in Israel. The two counsellors of David's time disappear, probably to make room for a whole body of legal advisers; the prophets are no longer found among the dignitaries of state, but new military charges are created instead. The immense accumulation of treasure also allowed the execution of a number of public works in Jerusalem, which now first assumed the magnificence and station of a capital. A new wall with fortified towers was erected around it; and under the king's immediate orders was built the Queen's Palace—'the House of the Forest of Lebanon'—with a long hall joined to it by a cedar porch, called the 'Tower of David,' outside of which a thousand golden shields were suspended, and within which the king sat, in all his imperial splendor, to pass judgment. His banquets, at which all the vessels were of gold; his stables, with their four (or forty) thousand stalls; his gardens and parks and summer retreats, were such as to dazzle even eastern fancy. Twelve commissaries, distributed in the different provinces, had each in his turn to furnish the means of sustaining this prodigious household. The dominion of S. extended from Thapsacus, on the Euphrates, to Gaza on the Mediterra-

near. The country was in profound peace; the treasures accumulated by David appeared inexhaustible; and the popularity of the king, who listened to the meanest of his subjects, and gave judgment according to that wisdom for which he had asked in his vision at Gibeon, in preference to any other gift, and which has remained proverbial from his day to ours, was naturally at first very great. Everything, moreover, was done to develop and increase the national wealth and welfare. The rich internal resources were developed, and extensive commercial relations were established.

Through the port established at Ezion-Geber, at the head of the Gulf of Elath, an outlet was gained to the Indian Ocean; and the alliance with Phœnicia, then under the sway of Hiram, King of Tyre, gave an energetic impulse to these foreign expeditions. Manned with Tyrian sailors, the Israelite fleets went to 'Ophir,' and brought back, in exchange for their own exportations, 'gold and silver, apes and peacocks, ivory and spices,' and the rest of the strange and precious produce of India, Africa, Spain, and other regions, possibly even the far British coasts.

According to his promise, S., in the fourth year of his accession, commenced the building of the Temple on Moriah, after the model of the Tabernacle; wherein he was aided by King Hiram, who sent not only timber, but architects and cunning Phœnician artists in wood and stone and metals. In the 11th year of his reign it was completed, and in the 12th year solemnly inaugurated—at which occasion prodigious numbers of sacrifices were slaughtered. Thirteen years more having been spent in the construction of the 'House of the Forest of Lebanon' (the royal palace), other buildings and fortifications —among them that of Palmyra—are recorded to have been undertaken by the king, who, far from wishing further to extend his dominions, was bent only on keeping his frontiers safe from the raids of the neighboring hordes, and for that purpose alone kept up an unprecedentedly large army.

The fame of S. could not but spread far and near. The splendor of his court and reign, heightened by his personal qualities, his wisdom and erudition—for he was famed as not only the wisest but also the most learned of men—brought embassies from all parts to Jerusalem to witness his magnificence and to lay gifts and tribute at his feet. The queen of Sheba's expedition and presents are well known; and as presents or tributes no less splendid were annually made him by many Arab kings, his income from different sources was calculated, in round numbers, at the enormous sum of 666 golden talents. That people of Moses, which was to know no other wealth than flocks and the fruits of the soil, had suddenly become a people of wealthy merchants, of soldiers, and of courtiers—and it did not profit by the change, chiefly through the bad influence of the king himself and his court. The army and the public buildings absorbed the resources of the prov-

inces. In the Temple, erected for the true worship of Jehovah, the one Living God, S. sacrificed three times a year; nevertheless, to please his concubines, he allowed, and perhaps himself indulged in, the rites of polytheism on various heights; thereby setting the worst example to his subjects, sufficiently eager already to worship the idols of the nations. His exaggerated polygamy fostered immorality and licentiousness among the people; and, worst of all, the wise and gentle monarch, as his treasure became exhausted, began, toward the end of his reign, to lay the yoke, which hitherto had lain only on his Canaanite subjects, upon the Israelites themselves. Thus he became, in fact, an eastern despot—selling part of his dominion to raise money, and trying to break the spirit of the nation by forced services and corporal chastisements.

Left by the 'prophets,' probably since his open and revolting infidelity with regard to the national worship of Jehovah, he found his advisers chiefly among insolent young courtiers, who awed even his aged counsellors into silence; and from that time a storm began to gather over the land. The priests were on the side of the malcontents; and a vague talk of a general rising, which actually found utterance by a 'prophet' in the very face of S., was heard throughout the country. Ahijah of Shiloh predicted, as Samuel had done to David, the partial dominion to the Ephraimite Jeroboam, who consequently had to flee for his life to Egypt. But notwithstanding these internal mutterings, and the open revolts of one or two subject chiefs, such was the prestige both of David's and of S.'s name, that the king was allowed to die in peace.

S. has been supposed to be the author of Canticles (q.v.), Ecclesiastes (q.v.), Proverbs (q.v.), besides works on science which are said to be lost. But he is also to be considered the prime cause of the final and decisive downfall of the Jewish commonwealth for all historical times. His wisdom, which turned into folly as his justice into tyranny, kindled a smoldering discontent which only awaited his death to break into open flames of revolt and internal wars. His character presents the lamentable spectacle of genius gone astray; and many have been the discussions among learned theologians as to any hope of his 'salvation.' His name and his fame, however, will, notwithstanding the shadows that shroud his latter days, remain immortal; whether we look at the striking picture of him given in Scripture, or to the more gorgeous kaleidoscope of eastern legends revolving round the golden name of Suleiman: the lord and master of all animate and inanimate beings under the sun, the most beautiful, the most wealthy, of all created men, and whose wisdom was as much without limits as were his riches and power.—See for such legendary accounts of S., Weil's *Biblical Legends*, the *Targums*, the *Koran*, Lane's *Arabian Nights*, D'Herbelot, Ginsburg, Fürst's *Perlenschnüre Suleiman-Nameh*, in 70 books, ascribed to a Turkish poet, Firdusi, etc.

SOL'OMON, Song of. See Solomon; Canticles.

SOL'OMON, Wisdom of. See Apocrypha.

SOLOMON-BEN-ISAAC. See Rashi.

SOL'OMON ISLANDS: double chain of islands in the Pacific, stretching more than 600 m. n.w. and s.e. between s. lat. 5°, e. long. 154° 40′, and s. lat. 10° 54′, e. long. 162° 30′. They are little known; but in the group are at least 7 islands 50-100 m. long and 15-30 m. broad, besides many smaller islands. By an agreement between Germany and England 1886, the n. chain is recognized as within the German, and the s. chain as within the British 'sphere of influence.' All the islands appear of volcanic origin, and on one, Guadalcanal, is an active volcano; on Bougainville, also, an active volcano is said to exist; on others are solfataras and boiling springs. The fauna is Papuan, and the flora shows strong Papuan affinities. The population is in race and language Melanesian, and is mostly in the condition of savages. Of the principal islands, these belong to Germany: Bougainville, Choiseul, Isabel; with Shortland, St. George, Ramos, Macqueen, Tasman, Ongtong Java, Gower, and Carteret; and to England these: Rubiana, Murray, Guadalcanal (or Gera), Malaita, Arossi.

SOLOMON, Seal of: the legend of the royal ring, upon which the name of God was engraved, and by whose power Solomon was enabled to control demons, is told at length in the Talmud (Gittin, 68) and has been curiously developed by Arabic writers. These declare that it was partly brass and partly gold, with which he signed respectively his commands to the good and the evil genii. They also affirm that the ring contained four jewels, received by Solomon from four angels, whereby he could control the four elements. The story of the ring of Polycrates, related by Herodotus (III., 41) and Strabo (XIV., 638), and made the basis of Schiller's poem under that title, finds its counterpart in the legend of the lost seal ring of Solomon, thrown by Asmodeus into the sea, by which act the monarch lost his power, underwent a series of transformations, until he discovered the ring inside a fish. The name 'Solomon's Seal' was later given by the Arabs to the six-pointed star-like figure engraved on the bottom of their drinking cups—a figure represented in western legends by the pentacle or druid's foot, supposed to have the seal's power to drive away demons. See Isaacs' *Stories from the Rabbis*, New York, 1894.

SOLOMON'S POOLS: these most celebrated of the various pools mentioned in Scriptures are found in Wady Urtas, between Hebron and Bethlehem, called El Burak by the Arabs, from which an aqueduct was carried which still supplies Jerusalem with water. They are three in number, partly hewn out of the rock and partly built of masonry, but all lined with cement, and

formed on successive levels, with conduits leading from the upper to the higher, and steps from the bottom to the top of each. All are formed in the sides of the valley of Etham, with a dam across its opening, which forms the east side of the lowest pool. Dr. Robinson (*Biblical Researches*, I., 348, 374) gives their dimensions as follows: (1) Upper pool, length, 380 ft.; breadth at east, 236 ft.; at west, 229 ft.; depth at the east, 25 ft.; distance above the middle pool, 160 ft. (2) Middle, length, 423 ft.; breadth at east, 250 ft.; at west, 160 ft.; depth, 39 ft.; distance above lower pool, 248 ft. (3) Lower, length, 582 ft.; breadth at east, 207 ft.; at west, 148 ft.; depth, 50 ft.

SOLOMON'S SEAL, n. *sŏl'o-monz sēl* (*Polygonatum*): a genus of plants of nat. order *Liliaceæ*, differing from Lily of the Valley (q.v.) chiefly in the cylindrical tubular perianth, and in having the flowers jointed to their flower-stalks. The COMMON SOLOMON'S SEAL (*P. multiflorum*) is found in woods and copses in many parts of England and Europe. It has a stem about 2 ft. high, the upper part bearing large, ovate-elliptical, alternate leaves in two rows. The flower-stalks are generally branched; the flowers not large, white, and drooping.—The NARROW-LEAVED SOLOMON'S SEAL (*P. verticillatum*) is a rare British plant, more frequent on the continent: the leaves are whorled.—The ANGULAR or SWEET-SMELLING SOLOMON'S SALT (*P. officinale*), also rare in Britain, more frequent on the continent, resembles the Common Solomon's Seal, but is smaller, and has greenish, fragrant flowers. The young shoots of *P. officinale* are eaten by the Turks like asparagus. The root is white, fleshy, inodorous, with sweetish, mucilaginous, acrid taste: it contains *Asparagin*. It is a popular application to bruises, to prevent or remove discoloration. A kind of bread has been made of it in times of scarcity. The berries are emetic and purgative.—American species are the SMALLER SOLOMON'S SEAL (*P. biflorum*), 1-3 ft., the flowers mostly in pairs, and the LARGER SOLOMON'S SEAL (*P. giganteum*) 3-8 ft., peduncles 2-8 flowered, both common. The False Solomon's Seal of a number of species is of a different genus (*Smilacina*), with terminal, not axillary, clusters of flowers. Solomon's Seal derives its name from stalk scars on the roots.

SOLOMON, STABLES OF: a name applied by the Arabs to the massive masonry which Herod constructed in the Temple area at Jerusalem to support a pavement on a level with the surface of the hill farther to the north. The whole of this superstructure was surrounded by a battlemented wall, with a number of gates. Porticos or cloisters were ranged around the wall's interior—the finest being those on the south, consisting of four rows of Corinthian columns of white marble, there being 162 columns in all. Solomon's Porch was the name given to the eastern cloister (John x., 23; Acts iii., 11, v. 12).

SOLON, *sō'lon:* most famous of ancient Greek lawgivers: approximately, B.C. 638–559; b. Salamis; of one of the most distinguished families of Attica. His father, Execestides, having seriously impaired his income by improvidence, S., while still young, embarked in trade. At first, however, S. appears as an amatory poet. His earliest appearance in politics was in the contest between Athens and Megara for possession of Salamis. By artifice, S. revived the martial spirit of his countrymen, which had sunk under repeated disasters, obtained command of a body of volunteers, and conquered the island about B.C. (596), in which, with others, he obtained a grant of land. Thenceforth his public career is conspicuously noble and honorable. He figures as a wise and unselfish patriot, seeking earnestly, and not in vain, to compose the distractions, partly social and partly political, that rent the city of Athens. The Athenians generally had thorough confidence in his integrity; and B.C. 504 he was chosen archon or chief magistrate, with permission to act as he saw best for the good of the state. To borrow a phrase from Roman history, he was invested with dictatorial power. The nature and extent of the Solonian legislation has been the subject of much criticism in modern times, and Grote, in particular, has shown that the 'later ancients' (Plutarch and Diogenes Laertius), on whom we are obliged to rely for almost all our information about S., are full of confusions, misapprehensions, and contradictions; and that it became their habit to attribute to the great Athenian all bits of wise legislation whose paternity they could not discover.

To alleviate the wretchedness due to the relations of debtor and creditor, so insupportable as to threaten civil war, S. proposed and carried a notable measure—the *seisachtheia,* or 'disburdening ordinance' [from *seiō,* I shake off, and *achthos,* burden]—for lightening the burden of debt that weighed down the *Thetes* or lower classes. How this was effected is not correctly explained by Plutarch; the most rational solution is given in Grote's *History of Greece* (III.). From redressing the grievances of a class, S. proceeded, at the solicitations of his countrymen, to remodel the constitution; and here, too, the qualities popularly associated with his name shine conspicuously. Abandoning the semi-civilized theory which regards the nobles as alone worthy of citizenship and of the honors of public office in the state, he introduced the timocratic, rather the plutocratic, principle—classifying citizens according to their wealth or property; the effect of which was not to wrest *all* power or dignity from the hands of the *Eupatridæ* or well-born class, but only to give a portion of it to others of lower rank who might be as wealthy, therefore, presumably, as intelligent and with as much at stake. This reform has been compared to that previously effected by Servius Tullius in the constitution of ancient Rome; and there is at least a striking resemblance in method, if not in design: see ROME. S. distributed the citizens into four classes: the first embraced all those whose yearly in-

come reached 500 medimni; the second, those of between 300 and 500 medimni; the third, those of between 300 and 200 medimni; and the fourth, those whose income fell below 200 medimni. The first three classes were liable to *direct* taxation; the fourth not; but all were liable to *indirect* taxation. The *Boule*, or Deliberative Assembly of Four Hundred, seems to have been left by S. the strictly aristocratical body that he found it. But its power was practically limited by a new *ecclesia* [company called out], or assembly of the four classes, whose ratification was necessary to all measures orginating in the *Boule*, or 'Upper House.' On the other hand, the *ecclesia* itself could originate nothing: thus the Attic aristocracy and the Attic plebs could mutually check each other's assumptions. The part of S.'s legislation relating to the industrial pursuits of the citizens appears as excellent as the rest, but the number of his special enactments is too great to be enumerated. They embraced almost every subject of social importance; and the best testimony to their value is in the fact that, when Peisistratos violently overthrew the political constitution established by his kinsman, he allowed his social legislation to stand: see PEISISTRATOS.

The story of S.'s leaving Athens for ten years after his labors as a lawgiver, and travelling into foreign countries, probably is historical, but its details are untrustworthy: in particular, the famous incident of his interview with Crœsus does not suit the requirements of chronology, and must be dimissed as a myth. During his absence, the old dissensions among the Athenians broke out; and when he returned, S. struggled in vain to repress them. A strong hand, as well as a wise head, was needed; and the conspiracy of Peisistratos was quite as much against anarchy as against the constitution. After S.'s defeat, he withdrew into private life, but occasionally assisted with advice his bold, ambitious, and able kinsman, who had so effectively crushed the Athenian 'disorderlies' of all parties.

SOLOR ISLANDS, *so-lor'*: groups of islands e. from Flores in the Philippines, between 122° 56′ 30″—124° 25′ e. long.; belonging to the Netherlands residency of Timor. Besides several groups of smaller islands, they consist of Solor, 105 sq. m., pop. 15,000; Adanara, 302 sq. m., pop. 36,000; Lomblem, 520 sq. m., pop. 120,000; and Pantar, 275 sq. m., pop. 60,000. Solor and Adanara are separated from Flores by narrow straits; Lomblem and Pantar lie in succession further east.

Solor has little cultivated land, the natives being good sailors, and employed in fishing. Much sulphur and saltpetre are found, from which gunpowder is made. The women weave coarse fabrics for clothing, and exotic cotton has lately been planted with success. Edible nests are extensively collected. In all the villages on the coast, markets are statedly held and numerously frequented. The natives near the sea are Malays, friendly to the Dutch; a few of them Christians, the others Mohammedans. Those of the interior are Alfoors, wild and warlike, who use

shield and bow, sword and firearms. Adanara is governed by an independent rajah. It is a lovely island, with hills and dales, picturesque villages, and cultivated fields. The people are Malays, partly Mohammedans, partly Rom. Catholics. Lomblem also is beautiful, the natives Malays; those of Pantar are Papuans.

The S. I. are mountainous; the volcano Lobetolle, in Lomblem, is 4,914 ft. high; and the mountains of Pantar, 3,332. They are clothed to their summits with forests. They are governed by the military commander at Larantooka, in e. Flores; a Dutch postholder being stationed at Lawajang, the chief place of Solor.

SO'LOTHURN: see SOLEURE.

SOLSTICE, n. *sŏl'stĭs* [F. *solstice*—from L. *solstĭtĭum*, a standing still of the sun—from *sol*, the sun: *sisto*, I make to stand]: that point in the ecliptic at which the sun is furthest from the equator, consequently at the turning-point of its apparent course. There are two such points in the ecliptic—one where it touches the tropic of Cancer, the other where it touches that of Capricorn: the former is the summer, the latter the winter S. to those who inhabit northern latitudes, and *vice versâ*.—The term is used also to signify the *time* at which the sun attains these two points in its apparent course—about June 22 and about Dec. 22. SOLSTITIAL, a. *sŏl-stĭsh'ăl*, pert. to or happening at a solstice, usually the summer one. SOLSTITIAL POINTS, the furthest n. and s. points of the ecliptic at which the sun arrives—the n. being called Cancer, the s. Capricorn. SOLSTITIAL COLURE, the hour-circle which passes through the solstitial points.

SOLT, *sōlt:* town of Hungary, 48 m. s. of Pesth, on a branch of the Danube. Pop. (1880) 5,692.

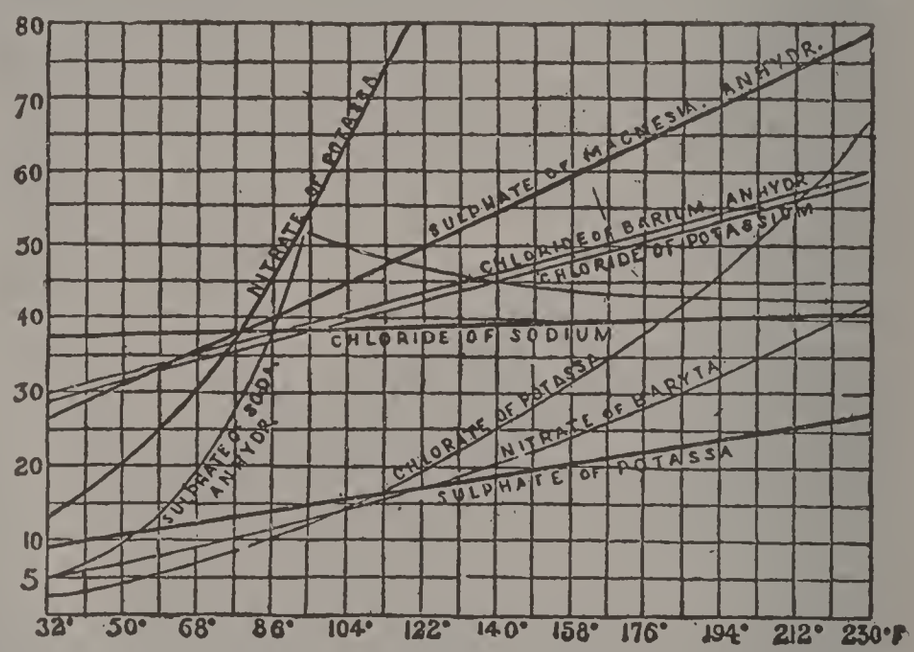
SOLUBLE, a. *sŏl'ū-bl* [F. *soluble*—from L. *solu'bĭlĭs*, soluble—from *solvo*, I loose, I dissolve; *solutus*, loosed: It. *solubile*]: that may be dissolved in a fluid; capable of solution. SOL'UBLENESS, n. *-nĕs*, or SOL'UBIL'ITY, n. *-bĭl'ĭ-tĭ*, the quality of being able to be dissolved in a fluid; in *bot.*, the property of separating into distinct portions by a kind of spurious articulation. SOLUTION, n. *sō-lō'shŭn* [F.—L.]: act of dissolving by means of a fluid; a liquid which contains one or more solid substances diffused throughout it (see below): explanation; the explanation or removal of a doubt or difficulty; the worked-out answer to a problem or an equation: in *law*, payment of debts. SOLUTIVE, a. *sŏl'-ū-tĭv*, tending to dissolve; laxative.

SOL'UBLE GLASS: see GLASS, SOLUBLE.

SOLUM, n. *sō'lŭm* [L. *solum*, ground or soil]: in *Scots law*, land; a piece of land.

SOLUS, a. *sō'lŭs* [L. *solus*, alone]: alone—used in stage directions

SOLU'TION: action that takes place in a substance when the force of adhesion between it and a liquid in which it is immersed is sufficient to overcome the force of cohesion between its solid particles: thus sugar or salt is dissolved by water, camphor or resin by spirit of wine, and silver by mercury. The liquid which effects the S. is termed the *solvent*, or sometimes the *menstruum;* and some solutions have special names—e.g., the term *syrup* is applied to a S. of sugar in water, and *tincture* to a S. of a solid in alcohol. If a solid body be introduced in successive small portions into a definite quantity of a liquid capable of dissolving it, the first portions disappear the most rapidly, and each successive portion dissolves more slowly than its predecessor, until a point is reached at which the liquid ceases to possess further solvent power. When this occurs, the forces of cohesion and adhesion are balanced, and the liquid is said to be *saturated.* S. is promoted by increasing the extent of surface in a solid, or by reducing it to powder. An elevation of temperature, by diminishing cohesion, will generally also increase the solvent



power of the liquid; but there are exceptions—e.g., in the case of lime and its salts—water just above the freezing-point dissolving nearly twice as much lime as when boiling. A compound of lime and sugar, very soluble in cold water, is separated from the S. almost completely, if heated to boiling. But the most remarkable case of the kind occurs in sulphate of soda (Glauber's-salt), which in its crystalline form dissolves in about ten times its weight of ice-cold water, and rapidly becomes more soluble as the temperature rises until it reaches 91° F.; from this point until the S. boils, the solubility slightly decreases, the boiling liquid retaining only about four-fifths of the quantity which was dissolved at 91° F. Carbonate and seleniate of soda, and sulphate of iron, exhibit the same peculiarity in less marked degree. 'These anomalous results may be partly explained,' says Dr. Miller, 'by the consideration

that heat diminishes the force of adhesion as well as that of cohesion. Generally speaking, cohesion is the more rapidly diminished of the two, although not uniformly so; and in these cases it would appear that the adhesive force decreases in a greater ratio than the cohesion of the saline particles' (W. A. Miller, *Chemical Physics*). The accompanying diagram shows the unequal solubility of various of the more common salts in water of different temperatures. The *lines of solubility* cut the verticals raised from points indicating the temperature on the lower horizontal line, at heights proportional to the quantities of salt dissolved by 100 parts of water: e.g., 100 parts of water dissolve—at 32°, 8 parts, at 122°, 17 parts, at 212°, 26 parts, of sulphate of potash. Water which has been saturated with one substance—that is, which refuses to dissolve any more of that substance—will often continue to dissolve others. In true or simple S., the properties of both the solid and the solvent are retained. When, however, any chemical action ensues between the solid and the liquid, the resulting S. commonly presents perfectly new and distinct features; e.g., when the metals are dissolved by acids, or oils by the alkalies (as in soap-making). For the solubility of the gases in water, see GASES.

The uses of S. in laboratory processes are numerous. By the difference in degree of solubility, we can separate one substance from another; and by dissolving a body, we can purify it either by filtration or crystallization. Moreover, when it is required that two bodies shall react on each other, they do so with incomparably more force in their dissolved than in their solid state.

SOLVE, v. *sŏlv* [L. *solvo*, I loose]: to give an explanation of; to clear up; to unfold; to disentangle; to dissipate, as doubts. SOLVING, imp. *sŏl'vĭng*. SOLVED, pp. *sŏlvd*. SOLVER, n. *sŏl'vĕr*, one who solves. SOL'VABLE, a. *-vă-bl* [F.—L.]: that may be solved or explained. SOL'VABLENESS, n. *-bl-nĕs*, or SOL'VABIL'ITY, n. *-bĭl'ĭ-tĭ*, capability of being dissolved; ability to pay all just debts. SOL'VENT, a. *-vĕnt*, having the power of loosening or dissolving; able or sufficient to pay all just debts, applied to a person or an estate: N. anything that dissolves another; a fluid in which a solid may be dissolved (see SOLUTION). SOL'VENCY, n. *-vĕn-sĭ*, ability to pay all just debts,—SYN. of 'solve': to unfold; explain; clear up; resolve; disentangle.

SOLWAY FIRTH, *sŏl'wā fĕrth:* in its upper part best regarded as the estuary of the river Esk; in its lower, as an inlet of the Irish Sea: separating n.w. Cumberland from s. Scotland. Its entire length, until lost in the Irish Sea, is calculated at 33 m.; its average breadth for the first 12 m. is not more than 2½ m., but afterward it gradually, though irregularly, increases to more than 20. The principal rivers flowing into it, besides the Esk, are the Annan, Nith, Dee, and Urr, from the n. or Scottish side; and the Eden and Derwent from the s. or English side. The most striking feature of the S. F. is the rapidity with which its tides ebb and flow. The spring-tides are peculiarly swift and strong—the wave rushing in 3 to 6 ft. high, 8 to 10 m. an

hour, occasionally damaging the shipping; and after its retreat leaving bare great stretches of the bed of the firth, so that in some places one can even cross over from the English to the Scottish shore. The salmon-fisheries of the Solway are valuable.—*Solway Moss* is a district of Cumberland about 7 m. in circumference, w. of Longtown, and immediately adjoining Scotland; formerly a bog, but now drained and cultivated. It is historically notable as the scene of a battle between the English and Scots 1542, when the Scots were defeated. Here also, 1771, Nov. 13, an extraordinary disaster occurred: the boggy ground, surcharged with moisture—the effect of heavy rains—rose, swelled, and burst like a torrent, sweeping along with it trees and houses, and destroying about 30 small villages.

SOLYMAN I., or SULEIMAN (THE NOBLE): emperor of Turkey, son of Bajazet I. After the defeat and capture of his father by Timour at the battle of Angora in 1402 he ascended the throne at Adrianople. In 1410 his subjects revolted, he was dethroned by his brother Mousa, and was shortly afterward slain. He is not regarded by Ottoman historians as a sultan since he governed a part only of the empire.

SOLYMAN II., EL KANOUNI (The Magnificent): emperor of Turkey, son of Selim I.; b. 1493; d. Szigeth, Hungary, 1566. He succeeded his father in 1520, crushed a rebellion in Syria in 1521, concluded a treaty of peace with Venice and then inaugurated the first of a long series of wars against Europe. He captured Belgrade in 1521, Rhodes in 1522, defeated the Hungarians with fearful loss at Mohács in 1526 and mastered Buda in 1529. He then laid siege to Vienna, but met with disastrous defeat. He took Bagdad in 1534, and on condition of an enormous yearly tribute, concluded a peace with Venice in 1539 and with Austria in 1547. He made successful war against Kurdistan, conquered Van and Tebriz, and part of Georgia in 1548, but in the next year met with continued losses at the hands of Austria, and in 1552 he was defeated with enormous loss in the siege of Erlau. His wars with Persia in 1554-5 were disastrous, as were also his Hungarian wars of 1558. He attempted to break Spain's naval power, but met with defeat at Malta in 1565, though he took the Isle of Chios in 1566. He was engaged in a war with Austria when he fell at the siege of Szigeth. His reign saw the zenith and the decline of Ottoman power. He remodeled the code of laws, introduced reforms in the judiciary and in taxation, and erected mosques and public buildings which are marvels of Ottoman architecture. He was also a poet and a patron of literature and art. In addition to his own superior abilities he was aided by statesmen, generals, and naval commanders of unquestionable greatness. His successes came principally in the early years of his reign, and though he left his empire with greatly extended

boundaries it had been much weakened by his long continued wars.

SOLYMAN III.: Turkish emperor; son of Sultan Ibrahim: b. 1642; d. Constantinople, Turkey, 1691. He succeeded to the throne on the deposition of his brother Mahomet IV., in 1687. His life had been spent in the seraglio in the study of the Koran, and feeling his incapacity to reign he entrusted the administration of the government principally to his grand vizier Kupruli Zadek Mustapha Pasha, the Virtuous. His reign saw the defeat of Turkish arms in Hungary and in Servia, the grand vizier meeting death at the disastrous defeat of Selankemen two months after the death of his master.

SOMA: a sacred plant of India, and an intoxicating drink prepared from it, the latter being a libation of great importance in the ancient religion of India. The draught is not only an offering to Indra, but in the form haoma is poured upon the ground, at the beginning of a meal, or at the reception of guests, as a drink-offering to the earth. Soma is also a lunar divinity, allied to Indra, the plant having been deified before the separation of the Indo-Iranians, on account of its moon-like swelling and color, and because of the maddening effects of its juice. It is, moreover, identified with the Hindus' mythical tree of life that grew in paradise, the juice of which imparted immortality, and which was guarded by spirits. The Rig-Veda refers to this in a hymn:

> We've quaffed the soma bright
> And are immortal grown,
> We've entered into light,
> And all the gods have known.

In the classical period of Hinduism Soma becomes the god of the moon. As moon, Soma was born from the eyes of Atri, a son of Brahman, the first god of the Trimûrti; and became installed by Brahman as the sovereign of plants, Brâhman'as, and planets. But he became arrogant and licentious, and carried off Târâ [lit., a star), wife of Vr'ihaspati, the preceptor of the gods. A war between the gods then broke out, which ended in restoring Târâ to her husband. The result, however, of her stay with Soma was the birth of a son named Budha, ancestor of the lunar dynasty of kings.

According to John Fiske, the soma is a plant connected mythically with lightning. Although several plants have been called soma, it is generally supposed that *Sarcostemma* (*Asclepias*) *acidum* is the plant indicated. It is a climbing plant, also called moon-plant, of the milk-weed family, with slender jointed stems and succulent pendulous branches, terminated by small umbel-like cymes of whitish fragrant blossoms. It has a milky juice. Soma is picked by moonlight, taken to a place of sacrifice, and crushed between stones; the juice is then strained and allowed to ferment. It is then offered to the gods, and afterward drunk by the priests.

SOMAJ, n. *sō-măj*, as in BRAHMO-SOMAJ [Hind. *somaj*, church or assembly]: sect recently sprung up among the natives of Hindustan. BRAHMO, *brâ-mō*, prefixed, indicates its monotheistic character (see BRAHMO-SOMAJ: SEN, KESHUB CHUNDER.

SOMALILAND, *so-mâ'lē-land:* maritime country in e. Africa, triangular in shape, bounded n. by the Gulf of Aden, s.e. by the Indian Ocean, s.w. by the Jub river. From the middle course of the Jub to Cape Guardafui, at the apex of the triangle, is nearly 900 m.; area estimated 330,000 sq. m.; but as great part of its interior is unexplored, the number of its inhabitants is unknown. The land is elevated and mountainous in the n., and slopes in terraces toward the s. The Jub, the s.w. boundary, is a large fertilizing stream, drawing its waters from the mountains of s. Abyssinia, and flowing s.e. between the territories of the Gallas on the w. and of the Somali on the e., to its mouth on the n. frontier of Zanzibar. S., in accordance with the Anglo-German agreement of 1890, is within the 'sphere of British influence.' The chief ports on the Gulf of Aden are Zeilah and Berbera. The exports are frankincense, myrrh, hides and horns, ostrich-feathers, superior coffee, indigo, and salt.

The present Somali or Somal race were originally Arabs, who landed on the African shore s. of the Gulf of Aden early in the 15th c. Driving back the earlier inhabitants, who were Christians, the Moslem made themselves masters of the country. They are said to be fierce and lawless; and fanatical Mohammedans.

SOMATIA, n plu. *sō-mā'shĭ-ă* [Gr. *sōma*, a body, *sōmăta*, bodies]: the small bodies or particles in the fovilla or protoplasm of pollen-grains.

SOMATIC, a. *sō-măt'ĭk*, or SOMAT'ICAL, a. *-ĭ-kăl* [Gr. *sōmatĭkŏs*, pertaining to the body—from *sōma*, the body]: belonging to the body. SO'MATIST, n. *-mă-tĭst*, one who admits the existence of corporeal or material beings only; a materialist.

SOMATO-, prefix, *sō-măt-o* [Gr. *sōma*, *sōmatos*, the body]: pertaining to or connected with the body.

SOMATOLOGY, n. *sō'mă-tŏl'ŏ-jĭ* [Gr. *sōma*, a body, *sōmăta*, bodies; *logos*, a description]: doctrine of organized bodies; also, in general, physics, or the science of material substances (see MATTER—also its references: ATOM: ATOMIC THEORY: FORCE, in Physics; also the references): also denoting specially, the science of the human body, as included in Anthropology (q.v.).

SOMBRE, a. *sŏm'bĕr* [F. *sombre*, dark—from L. *sub*, under; *umbra*, shade or shadow: Sp. *sombra*, a shade]: dark; dusky; gloomy. SOM'BRENESS, n. *-nĕs*, darkness, gloominess. SOM'BROUS, a. *-brŭs*, dark; gloomy. SOM'BROUSLY, ad. *-lĭ*. SOM'BROUSNESS, n. *-nĕs*, state of being sombre; darkness.

SOMBRERETE, *sōm-brā-rā'tā:* town of Mexico, state of Zacatecas, 90 m. n.w. from Zacatecas, in a mountainous district famous for rich silver mines, from which S. derives all its importance. Pop. 14,000.

SOMBRERO, n. *sŏm-brā'rō* [Sp. *sombrero*—from *sombra*, shade (see SOMBRE)]: a kind of broad-brimmed hat.

SOME, a. *sŭm* [Goth. *sums*, some one: Icel. *sumr*; Dan. *somme*, some: AS. *sum*, some one]: expressing an indeterminate number or quantity, more or less; denoting one person or thing; about, as *some* two dozen; certain; moderate; used improperly for *somewhat*, as, he is *some* better; *some* is used as opposed to *others:* PRON. a portion greater or less, as, *some* died. SOME'BODY, n. *-bŏd-ĭ*, a person unknown or uncertain; a person of consideration. SOME'HOW, ad. *-how*, in some way not yet known; one way or another. SOMESUCH, a. denoting a person or thing of that kind. SOMETIME, ad. once; formerly; at a time indefinite. SOMETIMES, ad. at intervals; now and then. SOMETHING, n. a thing unknown or not specified; a portion more or less; a little: AD. in some degree; somewhat. SOMEWHAT, n. something, though uncertain what; a part more or less: AD. in some degree; to a slight extent. SOMEWHERE, ad. in one place or other; in some place. SOMEWHILE, ad. once; for a time. SOMEWHITHER, ad. to some indeterminate place.

SOMEDEAL, or SOMEDELE, ad. *sŭm'dēl* [AS. *sumdæl*—from *dæl*, a part]: in *OE.*, in some degree.

SOMERSAULT, n. *sŭm'ėr-sawlt* [OF. *soubresault*, a somersault—from L. *supra*, above; *saltus*, a leap; *salīrĕ*, to leap]: a leap or spring in which a person turns with the heels thrown over his head, completing a circuit, and again alights on his feet.

SOMERSET, n. *sŭm'ėr-sĕt* [F. *soubresault*, a somersault]: a common spelling of SOMERSAULT, which see

SOMERSET, n. *sŭm'ėr-sĕt:* a saddle padded before the knee and behind the thigh; originally made for Lord Fitzroy Somerset—from whom it takes its name—who had lost his leg below the knee at the battle of Waterloo.

SOM'ERSET, Earl of (ROBERT CARR): about 1590–1645: see OVERBURY, Sir THOMAS.

SOMERSET, *sŭm'ėr-sĕt*, Lady HENRY: English philanthropist and reformer: 1851— ————; b. London; maiden name Somers-Cocks; daughter of Earl Somers. In 1872 she was married to Lord Henry S. For a time she was a leader of fashionable society, but after the death of her husband (1884) she retired to her vast estates and devoted herself to the religious instruction of her tenants and neighbors, building chapels, providing missionaries, and holding meetings. Later she became deeply interested in the Woman's Christian Temperance Union of America, and in 1891 attended the first world's convention of the W. C. T. U., at Boston, Mass. In connection with Frances Willard, who became her guest, Lady S. returned to England and advocated the enfranchisement of women, and labor and social-purity reforms, in connection with total abstinence from strong drink.

SOM'ERSET HER'ALD: see HERALD

SOM'ERSETSHIRE, *-shēr:* maritime county in s.w. England; bounded n.w. by the Bristol Channel, and touching Devon, Dorset, Wilts, and Gloucester; 1,049,815 acres=1,640 sq. m. Pop. (1891) 484,326; (1901) 385,060. Its form is oblong; length about 80 m., and breadth about 36. The surface is extremely diversified, with lofty hills, barren moors, rich vales, and marshy 'levels'—many thousands of acres of the latter being below high-water mark, and depending for security on sea-banks and sluices. The hills are in several ranges running e. and w.: one range, the Mendips (q.v.), runs from near the city of Wells to the coast at Brean-down. South of these hills is a vast marshy plain, on which the Polden Hills stand out abruptly like an island. Another conspicuous group, the Quantocks, rise near Taunton, and attain maximum elevation of 1,270 ft. In the extreme w. is the wild district of Exmoor Forest, composed almost entirely of barren hills—the highest, Dunkery Beacon, 1,668 ft. above the sea-level: this district is often supposed by tourists to be part of Devonshire. The rivers rise chiefly in these high grounds, and are small, except the Bristol Avon, which rises in Wiltshire, and for some miles divides S. from Gloucestershire. The Parret drains the middle districts, and is a tidal stream up to Bridgewater, presenting at spring-tides the phenomenon called the 'bore.' The soil is mostly fertile, and the pasture-lands are almost unrivalled for their luxuriance. The wheat and barley grown around Bridgewater are famous; but grazing and dairy-farming are the great objects of husbandry, and the cheese of Cheddar has wide reputation. Cider is produced in enormous quantities; but the prevalence of small farms keeps agriculture backward. The hilly districts are rich in minerals, especially iron, with some lead and calamine; and the Radstock and Bedminster coal-fields supply the n. districts with excellent fuel. The principal manufactures are woolen cloth, coarse linens, lace, silk, and gloves; but these industries are not progressive, and the pop. in the rural districts is diminishing. Medicinal springs are an important feature of the county, having brought into celebrity and sustained in splendor the city of Bath (q.v.). Weston-super-Mare, containing at the beginning of the 19th c. a few hovels, is now one of the finest watering-places on the west coast.—In ancient times, this part of the kingdom was inhabited by the *Belgæ*, and the Mendips appear to have formed so strong a barrier against the Roman and Saxon, that, even to this day, philologists can trace the strong Celtic element that held its ground here. Old British camps are very numerous on the hills; and extensive remains of stone circles are visible at Stanton Drew near Bristol. In Saxon times, S. was one of the earliest counties to embrace Christianity; and while a church was founded at Wells 704, on the site now occupied by the fine cathedral, a monastery was founded at Glastonbury, which eventually became one of the wealthiest in the kingdom. S. was the principal arena of the rebellion of the Duke of Monmouth, 1685.

SOM'ERS ISLANDS: see BERMUDAS.

SOMERSWORTH: township of Strafford co., s.e. N. H., including the village of Great Falls. It is on the Salmon Falls river, 5 m. n. of Dover, and on the Boston & Maine railroad. Great Falls is an important cotton-manufacturing village, whose factories employ 3,000 persons, containing also woolen mills, shoe factories, etc. Pop. (1900) 7,023; (1910) 6,704.

SOMERVILLE, *sŭm'ėr-vĭl:* city in Middlesex co., Mass.; on the Mystic river, and the Boston & Maine and the Fitchburg railroads; 2 m. n.w. of Boston; 4 sq.m. It was cut off from Charlestown 1842, received a city charter 1872, and for many years has been a favorite place of residence for business men of Boston. It is divided into 4 wards; is built on a number of hills, the highest of which are Spring, Central, and Winter; is lighted with gas and electricity; has 4 lines of street railroads; and contains many churches, and public schools of all grades, public library, savings bank, and weekly newspapers. The chief industrial establishments (1900) numbered 378; employed $10,131,596 capital and yielded products valued at $21,776,511. The industries include manufacture of steam-boilers, glass, earthenware, iron-foundry products, bricks, carriages, brass and copper tubing, and curried leather. Banking is done chiefly in Boston. Pop. (1900) 61,643; (1910) 77,236.

SOMERVILLE: N. J.; town in Somerset co.; on the Raritan river, and on the Central Railroad of New Jersey; about 25 m., in direct line, s.w. of Newark and 11 m. w.n.w. of New Brunswick. It was founded in 1665, and until 1809 was a part of Raritan. Somerville and vicinity was a camping ground for the American forces during the Revolution. It is in an agricultural region, but it has considerable manufacturing interests. The chief industrial establishments are woolen mills, agricultural implement works, and a shirt factory. There are seven churches, a high school, elementary graded schools, a Baptist classical school, and a public library, founded in 1871. The two national banks have a combined capital of $142,340; there is also a savings bank. Pop. (1900) 4,843; (1910) 5,060.

SOMERVILLE, *sŭm'ėr-vĭl,* MARY: famed for mastery of mathematics and physical science: 1780, Dec. 26—1872, Nov. 28; b. in the manse of Jedburgh; daughter of Admiral Sir William George Fairfax. She was brought up at Burntisland, and her mother taught her to read; but besides this, she had no education till she was nine years old. At the age of ten, she had a year more of schooling at Musselburgh; and returning home showed great taste for reading. After the age of 13, she twice had, during sojourn in Edinburgh, an opportunity of attending classes, studying music, drawing, and a little Latin, and of entering Edinburgh society. In an algebraic sum in a magazine of fashions, Mrs. Somerville made her first acquaintance with the subject that most

engrossed her attention in after-life. In 1804 she married her cousin, Capt. Greig, of the Russian navy, Russian consul in London; and removed to London. Capt. Greig died 1808, leaving her with two children. She bought books and pursued her studies. In 1812 she married another cousin, Dr. William Somerville, who warmly encouraged her in study. They removed to London 1816, where Mrs. Somerville went much into society, and became noted for scientific attainments. Visiting the continent with her husband, she made the acquaintance of many scientific men. Laplace spoke of her as the only woman who understood his works. In 1823 Mrs. Somerville was invited by Lord Brougham to try to popularize, for the English public, Laplace's great work, *Mécanique Céleste.* She published her work, *Celestial Mechanism of the Heavens,* 1830; and it at once made her famous. Mrs. Somerville was awarded a royal pension 1835. *The Connection of the Physical Science,* published 1834, has passed through nine editions. Her next work was *Physical Geography* (1848), of which there have been six English editions. *Molecular and Microscopic Science* appeared 1866. Mrs. Somerville for many years resided in Italy; and died at Naples. An autobiography, edited and supplemented by her daughter, 1873, is of much literary and personal interest.

SOMITE, n. *sō'mīt* [Gr. *sōma,* a body]: a single segment in the body of an articulate animal.

SOMME, *sōm* (anc. *Samara*): river of n. France, rising in the department of Aisne and falling into the English Channel. Its entire length is about 125 m., of which one-half is navigable, and its upper part is accompanied by a canal, so that it has great commercial importance, besides supplying valuable water-power. For paleolithic discoveries in the valley of the Somme, see ANTHROPOLOGY.

SOMME: maritime department in n. France, s. of Pas-de-Calais, and n.e. of Seine-Inférieure; 2,377 sq.m. (1,522,520 acres). Somme is mostly level, and in parts marshy. The department produces abundance of corn and fruits; cattle are reared; and there are extensive manufactures of linen, hemp, cotton, wool, mole-skins, velvets, serges, merinos, reps, poplins, ribbons, laces, embroidery, carpets, and woolen hose. There are iron and copper industries, steam-engine and machinery manufactures; and a great lock manufacture. Amiens is the largest town. Pop. (1901) 537,848.

SOMNAMBULATE, v. *sŏm-năm'bū-lāt* [L. *somnus,* sleep; *ambŭlō,* I walk]: to walk in one's sleep; to wander dreamily and listlessly; to dream or wander as a somnambulist. SOMNAM'BULA'TION, n. *-bū-lā'shŭn,* act of walking in sleep. SOMNAM'BULIC, a. *-bū-lĭk,* pertaining to somnambulism; that walks in sleep. SOMNAM'BULISM, n. *-bū-lĭzm,* act or practice of walking in sleep. SOM-

NAM'BULIST, n. *-bū-lĭst*, sleep-walker. Walking in sleep is the most palpable, but not the most marvelous, characteristic of this condition. The person affected walks, rides, climbs, with the eyes shut or insensible; his movements are precise, cautious, leading him into positions of difficulty and peril, which, if perfectly alive to their real nature, or if acting under the influence of ordinary motives, he would avoid; and yet there appears to be a partial consciousness of surrounding objects, and an adaptation to circumstances. Individuals have, while in this state, performed long journeys on foot or horseback, paying tolls, avoiding obstacles; they have successfully descended into coal mines; they have ascended in safety to the roofs of houses, have climbed rocky cliffs, and successfully robbed eagles' nests, during the night; millers, saddlers, grooms, seamstresses, all have performed their customary work with exactitude, but without any recollection of their exertions or industry. Notwithstanding the accuracy with which many acts are performed, that particular senses may be dormant is proved by insensibility to loud noises, and by such instances as that of a cook eating cabbage which had been substituted for a salad which he had carefully and artistically prepared. The senses, in relation to the idea or train of ideas present to the mind, appear to be awake, and preternaturally acute. *Artificial Somnambulism* (or Trance) is an analogous state, produced by 'hypnotization.' See HYPNOTISM; TRANCE.

SOMNAUTH, *som-nawt'*, or SOMNATH-PUTTEN, *som-nât'pŭt-tŭn'*: ancient decayed town of Guzerat, Hindustan; on the s.w. coast of the peninsula of Kattywar, about 33 m. from its s. extremity. Somnauth is fortified by a strong stone wall 9 ft. thick, with 38 towers; contains many mosques, and the ruins of the celebrated Hindu temple of the idol Somnauth. The ruins of the temple are in fair preservation, and give the idea of its having been a gloomy, massive oblong hall 96 ft. by 68 ft., crowned by a magnificent dome, and covered inside and outside with elaborate sculpture and carving illustrative of mythology. The splendor of this temple has doubtless been exaggerated by travelers; but a thousand years ago it was so famous as a place of pilgrimage for pious Hindus, as well as for its immense wealth—accumulation of centuries of gifts—that it attracted the zealous idol-destroyer Mahmud of Ghizni, who 1024 appeared before Somnauth, captured it, destroyed its great idol, and took as spoil the enormous wealth of its temple, whose beautiful sandal-wood gates were (it was said) brought back from the entrance to Mahmud's tomb in Afghanistan by the British 1842, 8 centuries afterward. They were, however, never restored to Somnauth. The repute of Somnauth as a place of religious pilgrimage, and its wealth, revived some time after its spoliation by Sultan Mahmud; and it is still a chief resort of pious

Hindus from all quarters. Pop. 6,644. See Price's *Mohammedan History,* II.; Dow's translation of the *Ferishta;* Mirkhond's *Rauzat-al-safa;* Sir John Malcolm's *History of Persia,* I.; Smith's *Life of Dr. John Wilson* (1878).

SOMNIFEROUS, a. *sŏm-nĭf'ĕr-ŭs* [L. *somnus,* sleep; *fero,* I bring]: causing or inducing sleep; soporific.

SOMNIFIC, a. *sŏm-nĭf'ĭk* [L. *somnus,* sleep; *facĭō,* I make]: causing sleep; tending to induce sleep.

SOMNILOQUISM, n. *sŏm-nĭl'ō-kwĭzm* [L. *somnus,* sleep; *loquor,* I speak]: talking in one's sleep. SOMNIL'OQUIST, n. *-kwĭst,* one who talks in his sleep. SOMNIL'OQUOUS, a. *-kwŭs,* apt to talk in sleep. SOMNIL'OQUI, n. *-kwĭ,* a talking in sleep.

SOMNIPATHY, n. *sŏm-nĭp'ă-thĭ* [L. *somnus,* sleep; Gr. *pathos,* feeling]: sleep from sympathy or some external influence, as from mesmerism. SOMNIP'ATHIST, n. *-thĭst,* a person in a state of sleep from sympathy.

SOMNOLENT, a. *sŏm'nō-lĕnt* [F. *somnolent*—from mid. L. *somnŭlen'tus,* negligent, drowsy—from L. *somnus,* sleep]: inclined to sleep; drowsy. SOM'NOLENCE, n. *-lĕns* [F.—L.]: inclination to sleep; also SOM'NOLENCY, n. *-lĕn-sĭ.* SOM'NOLENTLY, ad. *-lĭ.*

SON, n. *sŭn* [Goth. and Lith. *sunus;* Russ. *suin';* Dan. *sön;* Sw. *son;* AS. *sunu;* Ger. *sohn;* Skr. *sûnu,* a son: Fin. *sündua,* to be born]: a male child or male descendant; a term of affection and familiar endearment; an old person's address to a youth, as a priest or teacher to a disciple; a native; the produce of anything, or denoting some quality, as 'son of pride,' 'sons of light.' THE SON, the Second Distinction in the Trinity (see SON OF GOD, THE). SON-IN-LAW, n. the husband of a daughter. SON'LESS, a. *-lĕs,* without a son. SON'SHIP, n. state of having the relation of a son. SON OF GOD, SON OF MAN, titles of Jesus Christ. SONS OF THE PROPHETS, among the *anc. Jews,* young men under instruction for offices in the church and state, in schools or colleges.

SONANT, a. *sō'nănt* [L. *sonans* or *sonan'tem,* sounding; *sonārĕ,* to sound]: pertaining to sound; uttered with sound instead of breath alone; vocal.

SONATA, n. *sō-nâ'tă* [It. *sonata,* a sonata—from L. *sono,* I sound]: short piece of music intended for an instrument, as *cantata* is for the voice: the name Sonata is now applied most frequently to a kind of composition for the pianoforte. In general it may be described as a musical composition for a solo instrument, sometimes accompanied by one or two other instruments, and comprising three, four, or even more movements; these movements usually consist of a subject or subjects, given out first in the key of the dominant, and after certain episodes, in which these themes are presented in a great variety of aspect, they are repeated in the key of the tonic. This form is usually adhered to most closely in

the first movement of a sonata, and gives room for display of the inventiveness and musical resources of the composer. The second movement is generally slower and shorter than the rest, and often in the form of a theme with variations. The most important sonatas are for the pianoforte.—A short sonata with two, or at most three, movements, less elaborately worked, is called a *Sonatina.*

SON'CHUS. See SOW THISTLE.

SONDERBUND: a league formed in 1846 by seven Roman Catholic cantons of Switzerland against the Federal Diet, which had decreed the expulsion of the Jesuits. The Diet voted the Sonderbund illegal 1847, July 20. Freiburg, their stronghold, was captured Nov. 13; Lucerne, Nov. 24, and the Sonderbund was dissolved.

SONG, n. *sŏng* [AS. *sang;* Dut. *zang;* Dan. and Ger. *sang,* a song: Icel. *söngr,* a song; *sangra,* to whine, to murmur]: a short poem intended or fit to be sung; a ballad; a lay; a strain; poetry: the notes of birds (see SONG OF BIRDS). The term Song is applied generally to the poetical and musical composition in union, but sometimes to one or other separately. The poem generally turns on some single thought or feeling, and is divided into portions of returning measure. The term Song properly implying an air of a simple kind, is often incorrectly applied to the elaborate *aria* of the opera, or the solemn air of the oratorio. A song generally implies an air for a single voice—airs for more than one voice being, however, sometimes called part-songs. SONG'LESS, a. *-lĕs,* destitute of the power of song. SONG'STER, n. *-stėr,* one who sings, or is skilled in singing; a bird that sings. SONG'STRESS, n. *-strĕs,* a female singer. OLD SONG, a trifle. SONG OF DEGREES, a name applied to each of the 15 Psalms from the 120th to the 134th, because of their connection with the 'going up' or traveling to Jerusalem. —SYN. of 'song': ballad; sonnet; cantata; carol; canticle; versicle; canzonet; hymn; ditty; verse; poetry; lay; descant; strain.

SONGHAY, *sŏn-gā':* people of negro race in w. Sudan on both banks of the middle Niger (here called the Aribinda or the Gurma). The language of the Songhay stands isolated, but is spoken also in Timbuktu and in many oases of the w. Sahara. There was formerly a powerful Songhay empire, which embraced Islamism in the 11th c. In the beginning of the 16th c. it extended over Sudan as far as the e. shore of Lake Tchad, but it was overturned by the Moroccans 1592. The Songhay are now partly independent. Gagho, the ancient capital, was at the time of Barth's journey a mere village.

SONG OF BIRDS: musical cry of some birds. All birds have some voice or cry which they utter, and most of them various notes appropriate to various occasions. The power of producing clear and sweet musical notes is found chiefly in certain families of the order *Insessores;*

some of which, e.g., the lark, pour forth their song in the air; but the greater number, like the thrush and nightingale, are perched or sit while they sing. The compass and variety of notes, the power of trilling and shaking, the loudness, clearness, and sweetness of the song, differ much in different species, each of which may be as fully recognized by its song as by its form or plumage. Birds of the same species present notable differences of song in different districts, comparable to the differences of dialect and intonation between the human inhabitants of different regions of the same country. 'The song, for example, of a thrush near London, or in any of the home counties,' writes an English naturalist, 'has little resemblance, except in specific character, to that of the same bird in Devonshire or near Exeter. The same notes, I suppose, will all of them be detected, but they are arranged for the most part into a different tune, and are not sung in the same way. They are given with different values, and the singing is pitched in a different key.'

The singing of birds is chiefly connected with the pairing-time; though some birds sing at other seasons also, during fine weather, and when food is abundant, as if merely to utter their happiness, and, by uttering, to increase it. The singing of many birds is continued with frequency also during the period of incubation, but with some change of character. The male alone sings: female birds have voice also, but cannot warble like their mates. The song of birds is produced not by the larynx proper, but by the *syrinx* or lower larynx, a distinct organ.

There can be no doubt that the singing of the male bird attracts and pleases the female and that he delights in this exercise. In this respect there is no difference between the birds of most melodious song and those of harsh, discordant voice. In them may be seen also an emulation further displaying itself in combats: but questions of rivalry seem in part to be decided among some of the songsters of the groves by mere musical displays. The song of birds is accordingly made to play an important part in the theory of evolution by natural selection. Caged birds evidently often sing from emulation, or, more properly, stimulation.

The imitative powers so remarkable in the mocking-bird and a few other species are possessed by many birds to some extent. Canaries may be taught to sing a complete tune, and even to articulate a few words.

SONG-SPARROW: a well known sparrow, *Melospiza fasciata*, found in some one or other of its numerous races in all parts of North America except in the extreme north and south on the eastern side. The song-sparrow may be readily recognized by its thickly streaked plumage, brown above, ashy below, with the brown, black-centered streaks coalescing on the breast into a conspicuous spot. In most parts of the East song-sparrows

remain throughout the year, but there is nevertheless a distinct north and south movement, the winter birds of any given locality being visitors from the North. In the New England and most parts of the Middle States they are more plentiful in summer than in winter. During the latter season they associate more or less with flocks of fox-sparrows, white-throated sparrows and other species which frequent thickets along water-courses, but are much less gregarious than they. Their food consists of seeds of various kinds and in summer and autumn of insects and berries. They are chiefly birds of the ground and bushes, and are never seen in the high tree-tops. Few birds surpass the song-sparrow in the real melody of their simple song, and few birds require so little of sunshine to start the joyous outburst even in midwinter. They sing in every month of the year, but most persistently and sweetly during the breeding season. The nest, which is built on the ground or in a low bush or evergreen, is a bulky structure of grass, leaves, etc., lined with fine grasses or horse-hair, receives 4 to 5 greenish white eggs varied endlessly in the character of the spots and blotches of browns and lavender. Usually two or three broods are raised each season. Other eastern species of the same genus are the Lincoln's sparrow, *M. lincolnii,* and the swamp-sparrow, *M. georgiana,* while, besides the numerous varieties of the song-sparrow in the West and Southwest, two distinct species, *M. insignis* and *M. cinerea,* occur in Alaska.

SONIFEROUS, a. *sō-nĭf'ėr-ŭs* [L. *sonus,* sound; *fero,* I bear]: that gives or conveys sound. SONIFER, n. *sŏn'-ĭ-fėr,* acoustic instrument for collecting sound and conveying it to the ear of a partially deaf person.

SONNET, n. *sŏn'nĕt* [F. *sonnet*—from It. *sonetto,* a sonnet—from L. *sonus,* sound]: short poem or song usually of 14 decasyllabic lines, having two stanzas of four lines each, and two of three each, arranged and rhymed in a particular order. SON'NETEER', n. *-ēr'* [It. *sonettiere*]: a composer of sonnets or small poems—usually in contempt.—The *Sonnet* expresses one idea, mood, or sentiment, and its lines have a somewhat intricate arrangement of rhymes. It is admittedly one of the most refined and intellectual forms of poetic expression. Every sonnet should be full and complete, though terse; and be firmly but gracefully rounded off. The oldest extant specimens are those of Vernaccia, of the 12th c., and Peter delle Vigne, in the 13th c.; but the sonnet received its highest finish at the hands of Dante and Petrarch. Early in the 16th c. Sir Thomas Wyatt and the Earl of Surrey introduced it into English literature; and Sidney, Spenser, Shakespeare, Daniel, Drayton, Drummond, extended its use and scope. In the early Italian models, the first eight lines make two quatrains, and the remaining six, two tercets. The quatrains have two rhymes, usually arranged so that the 1st, 4th, 5th, and 8th lines rhyme,

as do the 2d, 3d, 6th, and 7th. In the tercets great liberty is allowed; but there are generally three rhymes, and they are never in couplets. There is no Italian precedent for the freedom taken by the English poets before Milton, including Spenser and Shakespeare, of making the sonnet simply a poem of three quatrains, with alternate rhymes, and a rhyming couplet (the common 'illegitimate' form). Some writers call a poem of several pairs of rhyming couplets a sonnet; also there are so-called sonnets of thirteen or fewer lines. Most of Milton's sonnets are a close approach to the true Italian type. Gray, Warton, and Bowles revived this form of poetry, and Wordsworth contributed about 400 sonnets to English literature. Samuel T. Coleridge, his son Hartley Coleridge, Keats, Shelley, Procter, Mrs. Browning, C. (Tennyson) Turner, Sydney Dobell, and D. G. Rossetti are known as sonnet-writers.—Of Portuguese sonnets Camoens has left nearly 300. See *The Sonnet,* by Tomlinson (1874), and the notes in the collections named below. Anthologies of the sonnet are numerous: Henderson's *Petrarcha* (1803); Capel Lofft's *Laura,* 5 vols. (1814), in six languages; and collections of English sonnets by Dyce (1833); Lees (1867); Dennis (1873); Main (1880); Waddington (1880-82); Caine (1882).

SONNINI DE MANONCOURT, *so-nē-nē' dĕh mâ-nōng-kôr',* CHARLES NICOLAS SIGISBERT: French traveler and naturalist: 1751-1812. Besides residing some years at Cayenne, he traveled in Egypt, Greece, the Archipelago, and Asia Minor. He made valuable researches in nat. history, and published several works, the chief being *Voyage dans la Haute et dans la Basse Egypte* (1799), and *Voyage en Grèce et en Turquie* (1801). He died at Paris.

SON OF GOD, THE: in dogmatic theology, the Second Distinction in the Trinity, commonly spoken of as the Second Person of the Trinity. If we examine the use of the name in the Scriptures, we find it to have been applied by the Lord Jesus to himself, as expressing to his disciples the mysterious relationship in which he stood to God.—The phrase was not altogether unknown to the Jews. The plural, 'sons of God,' occurs several times in the Old Testament; in some cases it is applied (tropically) to angels; in others to the children of Israel, who also in their collective capacity as the favored nation are twice called by God his 'son' (Ex. iv. 22, 23; Hos. xi. 1). The use made in the New Testament of the famous passage, Ps. ii. 7-12 ('Thou art my Son; this day have I begotten thee,' etc.), is thought by many to constitute conclusive evidence that the spiritually-minded among the ancient people recognized a 'Son of God.' It has been argued, however, that if the Hebrews generally, or even their spiritual leaders, had advanced to the knowledge of the Messiah as the 'Son of God' in any other sense than that he was prophetically filled with the Spirit of

God, both the idea and the phrase would have been far more prominent in the religion and literature of Israel. The idea of a 'Son of God' (in the divine sense) does not appear to have rooted itself in the Hebrew mind: hence, we find that the assumption of the title by the Lord Jesus provoked the bitterest opposition from the great majority of his countrymen. They hated him, not because he claimed to be the 'Messiah,' the 'Christ'; on the contrary, they were ready to accept as such any teacher whose words or works might seem to them to justify his claim to the dignity; but when Jesus, having first excited their antagonism by preaching a spiritual religion of holiness and humility, then proceeded to claim to be 'the Son of God,' equal and one with the Father, this claim was held to supply the final proof of blasphemy, and they sought to stone him. It was, in fact, this very assertion of his supreme essential divinity that cost him his life. See CHRIST, THE; CHRISTOLOGY; JESUS; TRINITY, DOCTRINE OF THE.

SONOMETER, n. *sō-nŏm'ĕ-tėr* [L. *sonus,* a sound; Gr. *metron,* a measure]: an instrument consisting of one or more cords or musical strings stretched along a box or table, weighted at one end and fixed at the other, and divided at pleasure by a bridge—used to exhibit the relations between musical notes; an instrument for testing the efficacy of the treatment for the cure of deafness.

SONORA, *sō-nō'ra:* frontier state in n.w. Mexico, bounded n. by the United States, w. by Lower California and the Gulf of California; 76,900 sq.m. Several fine bays indent the coast; lagoons occur near the shore; and in the w. part are several lakes. The great system of the Andes skirts the e. frontier, and throws off branches which occupy much of the surface of the state. In the w. the surface is mostly flat, with fertile soil and warm but variable climate. The chief rivers are the Rio Colorado, Sonora, Yaqui, and Mayo. Two abundant crops are gathered every year from the same land; and the principal crops are wheat, maize, peas, and beans; tobacco, sugar-cane, and cotton also are grown; and there is extensive cattle-rearing. But the wealth of the state is in its mineral treasures, which are considered inexhaustible, especially gold and silver. The capital of the state is Hermosillo. In 1842 Gándara, an ambitious provincial leader, made Sonora the theatre of a civil war. During the war with France (1862-7), interesting campaigns were conducted in the state. Hermosillo, captured 1866, May 4, by the republicans, was re-taken by the imperialists; but the French forces were withdrawn from Guaymas in September of the same year. Less than a decade afterward occurred the Yaqui war (1885-6). Pop. (1900) 220,553.

SONORIFIC, a. *sō'nō-rĭf'ĭk* [L. *sonōrus,* sounding; *facĭō,* I make]: producing sounds.

SONOROUS, a. *sō-nō'rŭs* [L. *sonōrus*, sounding, sonorous—from *sonor* or *sonōrem*, sound; *sono*, I sound: It. *sonoro:* F. *sonore*]: yielding a clear sound when struck; being of a clear loud sound; high-sounding; rich and full in sound. SONO'ROUSLY, ad. *-lĭ.* SONO'ROUSNESS, n. *-rĭs-nĕs*, quality of yielding sound when struck; grandeur of sound. See SOUND.

SONS OF THE AMERICAN REVOLUTION: a patriotic American society, organized in New York in 1889, Apr. Its objects are to perpetuate the memory and spirit of the men who achieved American independence by the encouragement of historical research in relation to the Revolution; the preservation of documents, records, and relics, and to foster true American patriotism. There are branches of the society in various states. The membership is 11,000.

SONS OF LIBERTY: an American patriotic association of the colonists called into existence by Lord Grenville's Stamp Act. They combined to throw off the allegiance to Great Britain and make America independent. The association began in New York and Connecticut. The Sons of Liberty joined the Society of Tammany early in the 19th c.

SONS OF THE REVOLUTION: an American patriotic society organized in New York in 1875 by John Austin Stevens and others. The practical work designed for the society includes the collection and preservation of manuscripts, records, and other documents relating to the War of the Revolution. There are branch societies in various states, including California. The membership is 7,500.

SONS OF VETERANS: an American patriotic organization founded in 1879. There are 27 state organizations and 2,000 local camps, and the membership exceeds 100,000. Those eligible to membership are all male descendants, not less than 18 years old, of all soldiers, sailors, or marines, who served with the Union forces in the civil war.

SONSY, or SONSIE, n. *sŏn'sĭ* [Scot., Gael. and Ir. *sonas*, prosperity, happiness]: *colloq.*, lucky; fortunate; good-humored; good-looking; fat; pleasant; plump; thriving; in good condition.

SONTAG, *sŏn'tăg* or *zon'tâch*, HENRIETTA: vocalist: 1806, Jan. 3—1854, June 17; b. Coblenz, Prussia. She was educated for the stage; and was greatly admired for her personal charm as well as for her musical gifts. After a brilliant operatic career at Vienna, Berlin, Paris, and London, she married Count Rossi, 1829, and left the stage 1830. Compelled by pecuniary difficulties to reappear 1849, she achieved renewed success in Europe and America. She died in Mexico.

SOOCEY, n. *sô'sĭ* [native name]: a mixed striped fabric of silk and cotton in India.

SOO-CHOW, or SU-TCHOU, *sô-chow'*, or SOO-CHOW-FOU, *fō'* [*fou* signifying *city*]: large city of China, province of Kiang-su, 60 m. w.n.w. from Shanghai. It is near the Grand canal, which connects Hang-chow with Nanking and Pekin; but its port is Shanghai, with which also it has water-communication. It is about 10 m. in circumference, and is inclosed by fortifications, outside of which are four very large suburbs. The country around is level, and remarkable for fertility, so that the Chinese speak of it as a terrestrial paradise. The city has silk manufactures, printing establishments, and large trade in books. In 1857 S. was captured and sacked by the Taepings. In 1863 it was invested by the imperialists, under a British officer, and the rebel chiefs, having surrendered, were beheaded by the gov. of the province. Pop. 500,000.

SOOLOO' ISLANDS: see SULU ISLANDS.

SOON, ad. *sôn* [Goth. *suns*, immediately; *sunsei*, as soon as: AS. *sôna*, soon: Dut. *saen*, immediately]: in a short time; without delay; early; quickly; before the expected time; promptly; readily; willingly. AS SOON AS, or SO SOON AS, immediately at or after another event. *Note.*—The distinction in use (but not universally recognized) seems to be: AS SOON AS, in affirmative or corresponding sentences —*as soon as* you have done your lessons you may go: *so soon as*, in negative or adversative sentences—the sun does not rise in winter *so soon as* it does in spring—see Brewer.

SOONAMOOKEE, n. *sôn'ă-mô-kē'* [Hind., the golden-face]: the state barge of the governor-general of India.

SOON'EE, or SOON'NEE: see SUNNITES.

SOONGA'RIA: see DZUNGARIA.

SOOSOO, *sō'sô* (*Platanista Gangeticus* or *Soosoo Gangeticus*): cetacean of the Dolphin family, inhabiting the Ganges, Brahmaputra, and Indus river systems of India. It is supposed to be the *Platanista* of Pliny. It is the only known existing species of its genus, and is interesting as a fresh-water cetacean. It attains the length of 8 ft., and is not unlike the dolphins in general form. Its habits are sluggish, except that in pursuit of prey it moves with great energy and rapidity. It is quite blind, and feeds on small fish and crustaceans, groping for them with its long snout in the muddy river-beds. The flesh resembles lean beef, but is never eaten by the Hindus, who, however, set a great value on the fat, which lies between the skin and the flesh, as an external medicinal application. There are several fossil species of this genus.

SOOT, n. *sût* [Icel. *sót;* Sw. *sot;* Dan. *sod;* Gael. *suith*, soot]: the portion of fuel escaping combustion, chiefly finely divided carbon: V. to cover or foul with soot. SOOT'ING, imp. SOOT'ED, pp. SOOT'Y, a. *-i*, producing, containing, or resembling soot; foul with soot; dusky; dark. SOOT'ILY, ad. *-i-lĭ*. SOOT'INESS, n. *-nĕs*, the quality of being foul with soot.—*Soot* is that portion of fuel which, escaping combustion, is mechanically carried up by the current of hot air, either to be deposited on the sides of the chimney, or to be discharged into the atmos

phere. The S. of coal and that of wood differ materially, the former containing more carbonaceous matter and more ammoniacal salts than the latter. Braconnet published an elaborate analysis of the S. of wood; but good recent analyses of both kinds of S. are still required. Both kinds are used as manure. Wood-soot (*fuligo ligni*) has been (and is still) used in medicine. According to Neligan, it has been found efficacious in later stages of hooping-cough; the tincture, says Dunglison, 'has been recommended as a powerful antispasmodic in hysterical cases;' an ointment of S. has been employed in various cutaneous diseases. Contact with S. often gives rise to a peculiar form of cancer, known as *Chimney-sweepers' Cancer*.

SOOTERKIN, n. *sût'ér-kĭn* [prov. Ger. *suttern*, to boil gently]: a species of false birth, fabled to have been produced by Dutch women from sitting so much over stoves; a proposal or scheme absurd and impracticable.

SOOTH, a. *sôth* [AS. *sóth*, truth: Icel. *sannr;* Dan. *sand;* Sw. *sann*, true, in accordance with the fact]: in *OE.*, true; faithful: N. truth; reality; in *OE.*, cajolery. SOOTH TO SAY, an asseveration of earnest assurance, as, with truth I now speak.

SOOTHE, v. *sôth* [Goth. *suthjan*, to tickle the ears: AS. *gesóthian*, to flatter: Icel. *suda*, to hum: Ger. *sausen;* Dan. *suse*, to buzz]: the radical meaning is, to lull or calm by a monotonous sound; to please with blandishments or soft words: to calm; to tranquillize; to assuage, as pain; to gratify. SOOTH'ING, imp.: ADJ. flattering; softening. SOOTHED, pp. *sôthd*. SOOTH'INGLY, ad. *-lĭ*. SOOTH'ER, n. *-ér*, one who soothes; in *OE.*, a flatterer.—SYN. of 'soothe': to appease; allay; alleviate; relieve; pacify; mitigate; soften; compose; mollify; tranquillize.

SOOTHSAY, v. *sôth'sā* [Eng. *sooth*, and *say*]: to utter predictions without inspiration; to prophesy. SOOTH'SAYING, imp.: N. the foretelling future events without being inspired. SOOTH'SAYER, n. *-ér*, one who undertakes to foretell future events; in *entom.*, any individual of the family *Mantidæ*, from the old belief that these insects would indicate by gestures the road a person who had lost his way should take.

SOOTY: see under SOOT.

SOP. n. *sŏp* [Icel. *soppa;* O.Dut. *soppe*, a sop: Sw. *soppa*, broth: Norw. *soppa*, bread and milk; *sabba*, to dabble; *subben*, soaked, wet: Goth. *supon*, to dip bread in sauce, to season]: anything dipped and softened in a liquid and intended to be eaten; anything offered to pacify—so called from the mythological story in which a *sop* is said to have been thrown to Cerberus to appease him: V. to steep or dip in a liquid for food. SOP'PING, imp. SOPPED, pp. *sŏpt*. SOP'PER, n. *-pér*, one who dips something in liquor that is to be eaten. SOP'PY, a. *-pĭ*, soaked or saturated with liquid. SOPS IN WINE, a popular name for the flower called pink. SOP IN THE PAN, a piece of bread soaked in the gravy of the dripping-pan; a tit-bit; a bribe.

SOPH, n. *sŏf* [contr. from SOPHISTER (q.v., under SOPHISM): Gr. *sophos*, wise, clever]: a student who has been two or three years at one of certain universities.

SOPHI, n. *sō'fĭ* [Pers. *sôfi*]: a title of the king of Persia.

SOPHI'A: capital of Bulgaria: see SOFIA.

SOPHI'A, ST.: see ST. SOPHIA.

SOPHI'A DOROTHE'A, Princess of Ahlden: see GEORGE I., King of Great Britain.

SOPHISM, n. *sŏf'ĭzm* [F. *sophisme*, a sophism—from L. and Gr. *sophisma*, a device, a quibble, a fallacy—from Gr. *sophos*, wise, clever]: a specious but fallacious argument; a fallacy or subtlety in reasoning. SOPH'IST, n. *-ĭst*, one of a body of men who arose in Greece, B.C. 5th c., and taught eloquence, philosophy, and politics, but who, by the use of vain subtleties and false axioms, incurred distrust and contempt (see SOPHISTS); a captious or fallacious reasoner. SOPHISTIC, a. *sŏ-fĭs'tĭk*, or SOPHIS'TICAL, a. *-tĭ-kăl*, deceitful or unsound in argument; fallaciously subtle. SOPHIS'TICALLY, ad. *-lĭ*. SOPHIS'TICATE, v. *-tĭ-kāt*, to adulterate; to debase; to corrupt by something spurious or foreign; to pervert. SOPHIS'TICATING, imp. SOPHIS'TICATED, pp.: ADJ., also SOPHIS'TICATE, a. not pure or genuine: adulterated. SOPHIS'TICATOR, n. *-kā-tĕr*, one who sophisticates. SOPHIS'TICA'TION, n. *-shŭn*, adulteration; admixture; matter added. SOPHISTER, n. *sŏf'ĭs-tĕr* [usually SOPH (q.v.)]: in the *universities of Cambridge, Oxford*, and *Dublin*, a student during his second and third years; in *OE.*, a disputant, subtle but fallacious; an insidious logician; a professor of philosophy; a sophist. SOPH'ISTRY, n. *-trĭ*, specious but fallacious reasoning; reasoning sound in appearance only.—SYN. of 'sophisticate, v.': to debase; adulterate; counterfeit;—of 'sophisticate, a.': spurious; supposititious; fictitious; corrupted; vitiated.

SOPHISTS, *sŏf'ĭsts:* chief public teachers in ancient Greece, B.C. 5th and 4th c.; whose character has been a subject of much dispute. Most of the historians of philosophy—influenced seemingly by the lampoons of Aristophanes, the comic poet, and by the disparaging remarks of Socrates, Plato, and Aristotle, who stood in a quite different position from the teachers by profession—represent the Sophists as 'ostentatious impostors, flattering and duping the rich youth for their own personal gain, undermining the morality of Athens, public and private, and encouraging their pupils to unscrupulous ambition and cupidity.' Grote, in *History of Greece*, chap. lxvii., has combated these positions, and given a much more favorable view, which, even though in parts too favorable, may yet properly modify the common censure.

A Sophist, in the original sense of the word, was a wise man, a clever man, one prominent for intellect or talent. Solon and Pythagoras are called S.; the name was applied even to great poets. Socrates was repeatedly so designated; Plato is alluded to by the same title. By the general public, any man of intellectual eminence would be spoken

of as a Sophist. With the feeling of admiration toward the intellectual class, there was mingled a certain invidious sentiment; and the name Sophist, being often used to express the dislike as well as the admiration, came ultimately to have a predominating bad sense. Still, the general public in the use of the word comprehended Socrates, Plato, and Aristotle, and their philosophical disciples and followers, equally with the distrusted professional teachers.

The great intellectual start in Greece during B.C. 5th c. led to an advanced standard of general instruction. There had been an established popular education long before—including music, reading, and recitation; but now there were found among the public teachers men of the highest accomplishments that the age could furnish, who taught whatever was known of astronomy, geography, and physics, as well as the new controversial discussions in ethics and metaphysics. They were 'the first professors of the higher education.' These men shared with the other intellectual celebrities the title Sophist. But there was one circumstance in their case that greatly deepened the invidious sentiment—they taught for pay. This brought them under the odium of two classes: in the first place, the poor felt themselves in a new position of inequality with the rich; secondly, the philosophers, properly so called, who had not yet begun to receive money from their disciples, held themselves superior to those that did. Both Socrates and Plato had vehement repugnance to the idea of a money-bargain between master and pupil; in their eyes, the relationship was one of pure attachment and devotion; and they considered that all the invidious part of the designation Sophist, and more, was deserved by the teachers for hire; and as these public teachers, by the nature of their vocation, would probably be often shallow and superficial as compared with the great philosophers, we can understand the full definition of Sophist by Aristotle—'an impostrous pretender to knowledge, a man who employs what he knows to be fallacy, for the purpose of deceit and of getting money.' With all the great authority of Aristotle, this charge applied indiscriminately to the body of men employed in training youth for active life will not stand. Enough is known of the lives, characters, and doctrines of the class to refute such indiscriminate accusation. The S. were a profession growing out of the circumstances, and supplying a want, of the age. The most valuable ideas and habits of any accomplished Athenian were due to his education under some teacher of the class Rhetor or Sophist. So far from the age of the S. being an age of corrupted public morality, Grote contends that it was the reverse: he adduces a multitude of historical facts to prove that the morality of the Athenian public was greatly improved at the end of B.C. 5th c., as compared with its beginning. Still, after conceding to the S. their undeniable merits, their own testimony as to their general method shows it to have had one grand defect—a tendency toward indifference to truth.

SOPHOCLES, *sŏf'o-klēz:* greatest master of Greek tragedy next to Æschylus: about B.C. 495–406; b. Colonus, a village about a mile from Athens. Sophillus, his father, a man of good birth and fortune, bestowed much care on his son's education; insomuch that, aided by his highly prepossessing appearance, S. was selected for his skill in poetry and music to lead with dance and the lyre, after the victory of Salamis, the chorus of youths in a triumphal pæan composed by himself. In his 28th year he is said to have *exhibited* his first play; and three years before, in a contest with rival scenic writers, one of whom was Æschylus, he gained the first prize, by the decision of the judges Cimon and his colleagues. He had, by Nicostrata, two sons; and one by Theoris, a Sicyonian woman. His private life was easy and contented, but not, as has been hastily assumed, profligate: indeed, his turn of mind was devout, as is evident throughout his plays; and he evinced no taste for political or active life, although he is said to have accepted command in the Samian war, and to have been engaged on foreign embassies. He was a prolific author: he was the reputed composer of as many as 130 plays, of which only seven remain. He gained, according to his biographer, the first tragic prize 20 times, bearing the palm on several occasions from Æschylus and Euripides, and from less-known competitors. He wrote also pæans, elegies, and epigrams, of which we have but few remains. He lived on terms of intimacy not only with his great rivals, but with Aristophanes and Herodotus. We have no knowledge of the order in which his plays that have survived were written: the most plausible arrangement is perhaps that of Müller, who graduates them as follows: *Antigone, Electra, Trachiniæ, Œdipus Rex, Ajax, Philoctetes, Œdipus Coloneus.* S. is justly accounted the most perfect of the Attic tragedians. His dramas show the unity in complexity which arises from one central and powerful conception. In his hands, tragedy becomes the true and faithful reflex of human feelings, passions, impulses. His ideas are ethical, with constant reference to a divine disposer of events. 'There has hardly,' says Müller, 'been any poet whose works can be compared with those of Sophocles for the universality and durability of their moral significance. Of all the poets of antiquity, he has penetrated most deeply into the human heart.' So clear and balanced was his style, that in a phrase he often presents vividly an entire character. His versification is remarkable for softness and fluency.—S. has had a multitude of editors. The best editions are those of Wunder (1831–46), Schneidewin, and Campbell (1874–82); with Gottfried Hermann's great critical editions (1823–30). The chief translations of S. into English are those of Potter (Lond. 1788), Dale (Lond. 1824), and Plumptre (1865): besides special translations by Prof. Thompson, of the *Ajax;* by Dr. Donaldson, of the *Antigone;* and by Prof. Campbell, of the *Antigone, Electra,* and *Dejanira.*

SOPHOCLES, *sŏf'o-klēz*, EVANGELINUS APOSTOLIDES, LL.D.: Greek grammarian: b. near Mt. Pelion, in Thessaly, 1807, Mar. 8; d. 1883, Dec. 12. Emigrating to the United States, he studied at Amherst 1829; then for a time taught school; was tutor in Harvard 1842–59; then he became asst. prof. of Greek there, and (1860) prof. of Greek, anc., Byzantine, and modern. He was author of several grammars and text-books for the use of students of Greek. Among his works are a *Romaic Grammar; History of the Greek Alphabet; Glossary of Later and Byzantine Greek; Greek Lexicon of the Roman and Byzantine Periods.*

SOPHOMORE, n. and a. *sŏf'ō-mōr* [probably from Gr. *sophisma*, sophism: L. *sophismari*, to argue sophistically, hence may have been formed *sophismator*, and from that *sophimore*, the original spelling of 'sophomore']: in colleges in the United States, a student in the second-year class; pertaining to the second-year class; befitting a college student of the second year; immature; inflated. SOPHOMORIC, a. *sŏf-ō-mŏr'ĭk*, befitting a sophomore.—In Eng. universities the term 'Sophister' is used in a like sense.

SOPH'TA: see SOFTA.

SOPORIFEROUS, a. *sō'pō-rĭf'ĕr-ŭs* [L. *sopor*, a heavy sleep; *fero*, I bring]: tending to produce sleep; narcotic. SO'PORIF'EROUSLY, ad. *-lĭ*. SO'PORIF'EROUSNESS, n. *-nĕs*, the quality of causing sleep.—SYN. of 'soporiferous': somniferous; narcotic; opiate; anodyne.

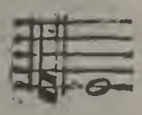
SOPORIFIC, a. *sō'pō-rĭf'ĭk* [L. *sopor*, a heavy sleep; *facĭō*, I make]: tending to cause sleep: N. a medicine or other substance that has the quality of inducing sleep.

SOPPY, SOPPED: see under SOP.

SOPRA, n. *sō'prä* [It. *sopra*—from L. *supra*, above]: in *music*, the upper or higher part. SOPRANO, n. *sō-prä'nō* [It.]: in *music*, the highest female voice; the treble; plu. SOPRA'NOS, *-nōz*, or SOPRA'NI, *-nē*. SOPRA'NIST, n. *-nĭst*, a treble-singer: see SOPRANO.

SOPRA'NO: highest species of human voice—properly of the female voice; whose range extends from to , or in some cases higher. The highest notes generally belong to the falsetto register. Sweetness and mellowness are the characteristic qualities of a S., which is usually less full than an alto; but lighter, fresher, and more expressive of joyful, lively, and highly impassioned feelings. Music for the S. is written mostly in the treble clef, but sometimes in the soprano clef with C on the first

SOPHOCLES.

line  . A voice sometimes distinguished as inter mediate between alto and soprano is the *Mezzo-soprano*, whose usual compass is from to .

SORA, *sō'rȧ:* city of s. Italy, province of Caserta; in a fertile plain, watered on one side by the Garigliano, which is spanned by two bridges at the town. The people are industrious and wealthy. There are manufactories of woolen cloth and of paper.—S., originally a Volscian town, passed into the possession of the Samnites, and then of the Romans. Remains of the cyclopean walls of the ancient citadel are still visible.—Pop. (1881) 5,411; commune 13,208.

SORACTE, *sō-răk'tē:* mountain in anc. Etruria, about 25 m. n. of Rome; now Monte Sant' Oreste. In anc. times S. was sacred to Apollo, whose temple crowned its summit, and on the e. slope was a grove sacred to the Etruscan goddess of flowers, Feronia. The mt. was resorted to yearly by worshippers of both these deities, who came in solemn procession. S. is about 2,170 ft. high, and is visible from Rome; very rarely indeed is it covered with snow, though a familiar ode of Horace suggests that in his time 'Soracte white with deep snow'—

> Vides ut alta stet nive candida
> Soracte—

was no unusual sight.

SORAU, *sō'row:* town of Prussia, province of Brandenburg, 54 m. s.s e. of Frankfurt-on-the-Oder. It has important bleach-fields, print-works, color-works, and various other manufactures. S. is one of the oldest towns in Prussia, having many ancient buildings—one church dating from 1204, the town-house, 1260, the old palace 1207. The new palace was built 1711.—Pop. 15,945.

SORB, n. *sŏrb* [L. *sorbus*, the sorb or service-tree]: the European mountain-ash or Service-tree (q.v.), and its fruit called rowans; the wild Service-tree is *Pyrus tormĭnālis*, the cultivated service-tree *P. sorbus*, and the mountain-ash or rowan-tree *P. aucupărĭă*, of the sub-order *Pomĕæ*, ord. *Rosăcĕæ*. SORBIC, a. *sŏr'bĭk*, of or from the sorb or service-tree or its fruit. SORBIN, *sŏr'bĭn*, or SORBITE, n. *sŏr'bīt*, a kind of sugar obtained from the berries of the mountain-ash.

SORBEFACIENT, a. *sŏr'bĕ-fā'shĭ-ĕnt* [L. *sorbĕō*, I suck up; *facĭō*, I make]: in *med.*, producing absorption: N. a medicine that produces absorption.

SORBONIST, n. *sŏr'bŏn-ĭst:* doctor of the *Sorbonne* (q.v.). SORBONICAL, a. *sŏr-bŏn'ĭ-kăl,* pertaining to the Sorbonists.

SORBONNE, *sor-bŏn':* celebrated academic body at Paris, dating from the middle of the 13th c., which, as the ancient faculty of theology, held till the French Revolution a prominent place in all church controversies. It derives its name from its founder, Robert de Sorbon, canon of Cambrai, b. 1201, at Sorbon in the Ardennes. He was a poor priest from Champagne, who came to Paris, and gained great repute for sanctity and eloquence; and was selected by Louis IX. as his chaplain and confessor. At this time the Univ. of Paris was at the height of its celebrity, and Robert de Sorbon resolved on opening in it an institution in which a society of secular priests, being provided with all necessaries for their maintenance, should devote themselves gratuitously to teaching theology. This institute was established with the sanction of King (afterward St.) Louis, 1252, originally for reception of 16 scholars, four respectively from the Gaulish, Norman, Picard, and English nations, to which the German was subsequently added. Robert was the first head; and 1270 drew up its constitution, which remained in force without any substantial alteration till the French Revolution. Soon the lectures at the S. attracted a multitude of students from the univ.; and before the end of the century the institution was organized into a full theological faculty, conferring the usual degrees in divinity of bachelor, licentiate, and doctor. The examinations for degrees were exceptionally rigorous. The candidate was required to sustain, against all antagonists, from the hour of five in the morning till seven in the evening, theses ('theses Sorboniques') or propositions selected from the whole range of theological science. The first disputant was a Franciscan friar named Mayron, scholar of John Duns Scotus: he was followed by many of the greatest names in mediæval and post-Reformation history. These 'Sorbonne Acts' form in some respects one of the most characteristic chapters in mediæval literary history. The disputants in some cases exceeded 60 in number. The foundation of Robert de Sorbon was approved 1268 by Clement IV.; but the name S. does not appear to have been appropriated to it till the 14th c. Robert de Sorbon established also a preparatory college for study of the humanities and philosophy, called the College of Calvi, or the Little S. In the 15th c. and throughout all the contests which followed the Reformation in France, the S. held an important place as an authority on theological questions; and nearly all the great names of the Gallican Church are included in its academic roll. Among the munificent works of the great Cardinal Richelieu, a pupil of the S., was what may be described as a complete reconstruction of the buildings. The new S. comprised, in addition to the public academic hall, lodgings assigned to the 36 doctors successively in the order of seniority. The head of the S. was called Provisor, and was elected by the

members, together with the archdeacon of Paris, the four deans of faculty, and some other dignitaries of the univ. Besides the resident members of the S., there were external associates, 'Socii Hospitalitatis,' who had no share in the governmental acts of the faculty. The S. continued to hold its privileges and its revenues down till the Revolution, when it shared in the common ruin of all the ecclesiastical establishments of France. At the reorganization of the univ. by Napoleon 1808, the S. was re-established as the theological faculty of that body; but it failed to recover its old prestige even with the clergy. One of the conditions of membership was an oath to maintain the celebrated four 'Gallican Propositions:' see GALLICAN CHURCH. This condition deterred many; and though it was revoked by the proposed concordat of 1817, yet, on the failure of this concordat, it continued in force till the revolution of 1830. After various changes, the S. is still an important theological school, with seven professors and a dean. These professors, however, are named by the minister of public instruction; and the absence of control on the part of the bishops over their appointment and their teaching has led to the general withdrawal of clerical students from their lectures: nevertheless, it still possesses at least the permissive sanction of the church. But the S. is now further the seat of two other faculties of the Académie of Paris (i.e., Univ. of Paris: see UNIVERSITY OF FRANCE)—those of letters and sciences; there being 12 chairs in the former faculty, and 7 in the latter. The other two of the five faculties, jurisprudence and medicine, are accommodated elsewhere. All the lectures are open gratuitously to the public (except women); but are attended by few regular students.

SORCERER, n. *sŏr'sér-ér* [F. *sorcier*, one who divines by casting lots—from mid. L. *sortĭārĭus*, a teller of fortunes by lot—from L. *sors* or *sortem*, a lot, an oracle]: a wizard who divines by the aid of magic or evil spirits: a magician. SOR'CERESS, n. fem. *-ĕs*. SOR'CERY, n. *-ĭ*, divination by the aid of evil spirits; magic; enchantment.—SYN. of 'sorcery, n.': enchantment; magic; witchcraft; conjuration; charms; incantations; spells.

SORD, n. *sword:* OE. for SWARD, which see.

SORDES, n. *sŏr'dēz* [L. *sordēs*, dirt]: foul or effete matter; dregs.

SORDET, n. *sŏr'dĕt:* a sordine, which see.

SORDID, a. *sŏr'dĭd* [F. *sordide*—from L. *sordĭdus*, dirty, unclean—from L. *sordēs*, dirt, filth: It. *sordido*]: mean; base; vile; meanly avaricious; very niggardly; in *OE.*, dirty, filthy. SOR'DIDLY, ad. *-lĭ*. SOR'DIDNESS, n. *-nĕs*, the state of being sordid; baseness; meanness.—SYN. of 'sordid': foul; gross; filthy; dirty; vile; base; covetous; niggardly; avaricious.

SORDINE, n. *sŏr'dĭn* [It. *sordina*, a sordine—from It. *sordo;* F. *sourd;* L. *surdus*, deaf, dull-sounding]: a damper put into the mouth of a horn, or on the bridge of a violin, to muffle or soften the sound.

SORE, a. *sōr* [Icel. *sar*, wound, sore: Dut. *zeer;* Icel. *sarr;* AS. *sár*, painful]: tender to the touch; affected with pain; painful; distressing, as a calamity; much troubled, as the mind; in *OE.*, bad: N. a part in an animal body where the skin is ruptured or bruised; an ulcer; a wound; grief; affliction: V. in *OE.*, to wound; to make sore: AD. intensely; severely. SORELY, ad. *sōr'lĭ*, very; very much; exceedingly. SORE'NESS, n. *-nĕs*, the tenderness of any part of an animal body; trouble of mind. SOR'ER, a. in *OE.*, worse. *Note.*—In the sense of 'very, or very much,' SORE or SORELY, as in '*sorely* distressed, *sore* afraid,' may be compared with Ger. *sehr*, very, exceeding.

SORE, or SOAR, n. *sōr* [F. *saur;* It. *sauro*, of a sorrel or brown red color—allied to SEAR, which see]: in *OE.*, a hawk of the first year; a buck of the fourth year: see SOREL.

SORECIDÆ, *sō-rĕs'ĭ-dē:* family of Mammalia, of the order *Carnaria* and section *Insectivora* of Cuvier. They are generally small animals, covered with soft hair; under which, on each flank, is a band of stiff closely-set bristles, and among them glands which exude a peculiar odorous fluid. The legs are short, and the feet are five-toed, and generally formed for burrowing. Some species are aquatic, and their feet webbed. The S. all are plantigrade. Most of them are nocturnal. They generally feed on insects and worms. A remarkable characteristic of the family is the elongated muzzle. They have long incisors, and their molar teeth are generally furnished with conical points. The tail is generally scaly. To this family belong Shrews, Shrew-mice, Musk Rats or Desmans, etc. They are found both in warm and in cold climates. Those in cold climates usually pass the winter in a lethargic or dormant state.

SOREDIA, n. plu. *sō-rē'dĭ-ă* [Gr. *sōros*, a heap or pile]: in *bot.*, powdery cells on the surface of the thallus of some lichens.

SOREL, n. *sŏr'ĕl* [F. *saur*, brownish-red (see SORE 2)]: in *OE.*, a buck of the third year.

SOREL, *so-rĕl'* (formerly WILLIAM HENRY): town, cap. of Richelieu co., Quebec, Canada; on the Richelieu river, at its junction with the St. Lawrence, and on the Grand Trunk railroad; 45 m. n.e. of Montreal. It is an important manufacturing place, producing steam-engines, milling machinery, agricultural implements, leather, bricks, lumber, and flour, and building coasting-vessels; and has a large trade in lumber and with American coast-ports. The town contains an attractive public square; several churches and public schools; Rom. Cath. college, acad., hospital, and convent; and 1 daily, 1 semi-weekly, and 5 weekly newspapers. Pop. (1891) 6,669; (1901) 7,057.

SORESINA, *sō-rā-sē'nâ:* mercantile town of n. Italy, province of Cremona. A great trade is carried on in a kind of condiment called *Mostarda* which is prepared there, consisting of fruits, etc., preserved in vinegar and sugar; also in a kind of liqueur called *Mistrà*, in great repute in Italy as a carminative. Pop. 8,553.

SORGHO, n. *sŏr'gō,* and SOR'GHUM, n. *-gŭm* [E. Indian name]. See DURRA; SUGAR.

SORI, n. plu. *sō'rī* [Gr. *sōros,* a heap or pile]: in *bot.,* the patches of sporangia on the back of the fronds of ferns. See SORUS.

SO'RIA. See NUMANTIA.

SORITES, n. plu. *sō-rī'tēz* [L. *sorītēs*—from Gr. *sōrei'tēs,* a sorites—from *sōros,* a heap: It. and F. *sorite*]: in *logic,* an abridged form of stating a series of syllogisms, the conclusion of each becoming the premise of the one following.

SORN, v. *sŏrn* [F. *séjourner,* to sojourn, to remain (see SOJOURN)]: in *Scot.* and *OE.,* to obtrude and live at free quarters in the house of another; to sponge upon. SORN'ING, imp.: N. the act of living at free quarters upon another without leave. SORNED, pp. *sŏrnd.* SORNER, n. *sŏrn'ėr,* one who lives at free quarters in the house of another without leave.

SOROLLA, JOAQUIN: Spanish painter: b. Valencia, 1863, Feb. 27. Left an orphan at the age of 2, he and an infant sister were adopted by an aunt, Dona Isabel Bastida, to whose husband the child was later apprenticed to learn the trade of locksmith. An idle lad in school, preferring to adorn his copy book with rude drawings rather than to follow the copies set, he was equally idle as a youth at his trade, so when the capture of all the prizes in the local drawing class to which his master-uncle sent him showed beyond doubt in which direction his talents lay, he was sent to the academy of fine arts in his native Valencia, and again marked his ability by capturing every prize for which he was eligible to compete. The first painting that attracted attention was *The Second of May,* exhibited in Madrid in 1884, when the artist was in his 22d year. There was nothing remarkable about the work beyond its appeal to local pride, except that it had been painted out-of-doors and in an unusual degree gave in proper manner the accessories of a battle. The same year another picture won him a traveling scholarship, on the proceeds of which he saw the work and made the acquaintance of the French and other painters of the day, and spent several years in hard work and study at Rome and elsewhere, perfecting his technique and finding himself. About 1890 he had mastered a style, and from that time on exhibited marvelous and almost miraculous fecundity and quality, interpreting all aspects of present day Spain—portraits of royal personages, nobles, commoners, landscapes, wonderful sea-views, the joys of infancy, the playful scenes of youth, the sorrows and problems of middle-life and old-age, the schemes of ill-doers, the toilers on land and sea, and the pastimes and life of the peasantry. His work is all done out-of-doors and is executed with extraordinary rapidity, and therefore somewhat impression-

istic, but splendidly drawn, and so suffused with sunlight and vivid colors that his canvasses grow like jewels. In the winter and spring of 1909 an exhibition of 600 paintings in New York City attracted an attendance of more than 150,000 persons, and every picture that was to be sold was purchased long before the exhibition closed. His place is in the very front rank of Spanish painters, with such artists as Goya and Velasquez.

SORORICIDE, n. *sō-rŏr'ĭ-sīd* [L. *soror* or *sorōrem*, a sister; *cædo*, I kill]: the murder or murderer of a sister.

SOROSIS, n. *sō-rō'sĭs* [Gr. *sōros*, a heap]: in *bot.*, a kind of fleshy fruit formed by the consolidation together of many flowers, seed-vessels, and receptacles, as the pine-apple, the bread-fruit, the mulberry, etc.

SOROSIS, *sō-rō'sĭs:* club for women exclusively, organized in New York 1868, Mar. 18, 'to promote pleasant and useful relations among women of thought and culture, and render them helpful to each other.' The admission fee is $5; annual dues $5; and admissions are by ballot. There are 10 standing committees, including those on education, art, science, music, drama, journalism, and philanthropy, which have charge of the details of all social meetings. Social and business meetings are held twice a month, and several special ones each year to which gentlemen are invited. It was founded by Mrs. J. C. Croly ('Jenny June'), its president for many years. Its membership is of women well known in musical, dramatic, scientific, literary, and philanthropic interests.

SORRAGE, n. *sŏr'ĭj* [etym. doubtful, perhaps from F. *sur*, above]: the blades of green wheat or barley.

SORREL, a. *sŏr'rĕl* [F. *saure*, a yellowish-brown: It. *sauro*, the sorrel color of a horse (see SORE 2)]: of an obscure or faint reddish color: N. a sort of yellowish-brown.

SORREL, n. *sŏr'rĕl* [OF. *sorel*, the herb sorrel: F. *sur;* AS. *súr*, *sour* (see SOUR)], (*Rumex*): genus of plants of nat. order *Polygoneæ*, very closely allied to *Polygonum* (q.v.) and *Fagopyrum* (see BUCKWHEAT), but having the perianth divided into six segments, the three inner of which enlarge and cover the *achenium*. The genus is naturally divided into two sections: for the first section, see DOCK.—The name Sorrel belongs only to the second section, characterized by diœcious flowers and acidity of stems and leaves. COMMON SORREL, *R. acetosa*, is a perennial found in meadows and pastures throughout Europe. Its stem is from one to two feet high, its leaves arrow-shaped. It is an agreeable salad, and is used in soups and sauces, and as an addition to dishes of greens: it is sometimes cultivated in gardens.—FRENCH SORREL, or ROMAN SORREL (*R. scutatus*), native of France and Italy, has broader and blunter leaves and is more frequently cultivated than Common Sorrel, being considered of finer flavor.—SHEEP'S SORREL, *R. acetosella*, which is

our Common Sorrel, is a very similar plant, but of much smaller size, and its roots run very much underground, so that it is a troublesome weed in gardens and fields of poor, dry soil, in which it is very common.—For WOOD SORREL, see OXALIDEÆ.—For the RED SORREL of the W. Indies, see HIBISCUS.—*Salt of Sorrel* is Oxalic Acid, so called because contained in the juice of the wood-sorrel.

SOR'REL TREE (*Oxydendrum arboreum*): tree of nat. order *Ericeæ,* remarkable in that portion of the order to which it belongs for its magnitude, its near allies being generally small shrubs. It grows chiefly on the Alleghany Mountains from Pennsylvania to Ohio and s., and attains a height of 50 ft., with a trunk 12-15 inches in diameter. The wood is of little use. The leaves are acid, and are sometimes used for dyeing wool black. They resemble those of the peach-tree; and the flowers are white, in a long one-sided raceme at the end of the branches, in early summer.

SORRENTO, *sor-rĕn'tō* (L. *Surrentum,* Gr. *Syrentum*): maritime town in s. Italy, province of Naples; on the s.e. side of the beautiful Bay of Naples, on the promontory separating the bay from the Gulf of Salerno; about 7 m. s.w. of Castellamare. It is an archiepiscopal see, and possesses a cathedral. The principal industries are silk culture and silk manufacture, and the inlaying of wood. There are still considerable remains of the walls erected in the middle ages; and on the landward side it is surrounded by a broad and deep ravine, the side toward the sea being protected by precipitous rocks. On the n.w. of the town is a considerable plain or table-land, called *Piano di Sorrento,* about 1,000 ft. above sea-level, surrounded and protected from the cold e. winds by a range of hills; it is intersected by numerous gorges and ravines, studded with villas and farm-houses, and covered with orange groves and vineyards; all which combined render the vicinity of the city highly picturesque. It is celebrated for the mildness, dryness, and general salubrity of its climate, on which account it has been much resorted to in ancient and modern times by invalids and convalescents. Among the Romans, the wine of Sorrento was in high repute: it had to be kept about 25 years before arriving at maturity. Tasso was a native of Sorrento. Pop. (1901) 8,933.

SORRILY, and SORRINESS. See under SORRY.

SORROW, n. *sŏr'rō* [AS. *sorh;* Dut. *zorg;* Dan. and Sw. *sorg;* Goth. *saurga;* Ger. *sorge;* Icel. *sorg,* care, sorrow: Fin. *suru,* grief]: mental pain or uneasiness, caused by some loss or by a disappointment; affliction; grief; regret; in *OE.,* bodily pain: V. to grieve; to feel mental pain; to be sad. SOR'ROWING, imp.: ADJ. feeling grief or regret: N. the feeling or expression of sorrow. SOR'ROWED, pp. *-rōd.* SOR'ROWFUL, a. *-fûl,* sad; mournful; grieving for some loss or disappointment; depressed; dejected. SOR'ROWFULLY, ad. *-lĭ.* SOR'ROWFULNESS, n.

-nĕs, the state of being sorrowful; grief. SOR'ROWLESS, a. *-lĕs,* free from sorrow. SORROW-STRICKEN, a. exceedingly depressed by grief for some loss.—SYN. of 'sorrow, n.': affliction; distress; pain; trouble; grief; sadness; mourning; lamentation;—of 'sorrowful': dismal; disconsolate; dreary; doleful; baleful.

SORRY, a. *sŏr'rĭ* [AS. *sárig,* sorry—from *sár,* a wound, a sore: Dut. *zeerig;* OHG. *sêrig,* painful, sad—from SORE 1, which see: comp. Gael. *saor,* cheap]: grieved for something past; vexed; moderately vexed; afflicted; pained; poor; mean; worthless. SOR'RILY, ad. *-rĭ-lĭ.* SOR'RINESS, n. *-nĕs,* the state of being sorry or pitiful; meanness; poorness.—SYN. of 'sorry': dismal; grievous; hurt; vexed; chagrined; melancholy; mortified; afflicted. *Note.*—SORRY is not the adj. of *sorrow,* with which it has no etymological connection.

SORSOGON: Philippines: (1) Pueblo, capital of the province of Sorsogon, Luzon, on Bay of Sorsogon. The bay is 19 m. in length from the town to its entrance and affords one of the best harbors in the Philippine archipelago. Sorsogon is a port of call for steamers from Manila, and has a considerable export trade, particularly in hemp and copra. In 1840 it suffered from an earthquake which lasted almost continuously for 35 days; the churches were destroyed, 17 persons were killed and many injured, and the ground for some distance sank five feet below its former level. Pop. 10,720. (2) Province of the island of Luzon, situated in the extreme southeastern end of the peninsula of Luzon, bounded on the n. by the province and the bay of Albay, and on the s. by San Bernardino Strait, length from n.w. to s.e. 47 m.; greatest width, 40 m.; area, 663 sq.m.; with dependent islands, 675 sq.m. The coast line is very irregular, on the n.w. coast is the deep indentation of the Bay of Sorsogon, and on the n.e. coast Sógod Bay, an arm of Albay Gulf; from the extreme n.e. shore of the Bay of Sorsogon to the nearest waters of Sógod Bay the distance is but 3 m. The mountain system of the province includes a range in the n., forming the boundary line with Albay, and another range extending from n.e. to s.w., forming the central watershed, but nearer the e. coast than the w. In this range is the active volcano of Bulusan, visible for 60 m. at sea. The largest river of the province rises on the western slopes of Bulusan; there are many small tributary streams. There are comparatively few highways, one road connects Sorsogon with Bacón on the opposite coast, and there are several trails; there is much coastwise trade in native canoes. The staple products of Sorsogon are hemp and copra (a product of the cocoanut, the form for shipment to be made into oil), and large quantities of both are exported. Native textiles, cordage, etc., are manufactured from the hemp; and the cultivation and manufacture of hemp, and the cultivation of the cocoanut are the principal industries. Sorsogon

was formerly a district of the province of Albay, and in 1901 was created a province and placed under civil government in accordance with the provision of the law of the Philippine Commission. Pop. 98,650.

SORT, n. *sŏrt* [F. *sorte,* a kind, a species—from L. *sors* or *sortem,* lot, chance, condition: It. *sorta,* sort, species: Dut. *soorte,* a lot]: a kind or species; any number or collection of persons or things more or less resembling each other in qualities or appearance; class; order; rank; degree of any quality; in *OE.,* lot; fate; destiny: V. to reduce to order; to separate into classes; to be joined with others of the same species; in *OE.,* to terminate; to fall out; to choose from a number. SORT'ING, imp.: N. arrangement. SORT'ED, pp. arranged; put in order. SORT'ER, n. *-ėr,* one who sorts. SORT'ABLE, a. *-ă-bl,* that may be sorted; suitable. SORTANCE, n. *sŏrt'-ăns,* in *OE.,* suitableness; agreement. SORTS, n. plu. varieties. OUT OF SORTS, out of order; unwell.—SYN. of 'sort, n.': species; kind; class; rank; condition; degree; manner; quality; character; nature; form; genus; order; air; company.

SORTES BIBLICÆ, *sawr'tēz bĭb'lĭ-sē*—SOR'TES VIRGILIANÆ, *vėr-jĭ-lĭ-ā'nē*—ETC.: modes of divination by means of verses of the Scripture, or of poets, as Virgil, Homer, etc.: the general name of this form of divination is *Stichomancy* [Gr. *stichos,* verse; *manteia,* divination]. The method was to select a number of verses from a poet, mix them together in an urn, draw one out at random, and from its contents to infer good or evil. As Virgil was the most popular and admired of all the Latin poets, his writings, especially the *Æneid,* became a favorite book for this purpose; and undoubtedly this practice laid the basis of Virgil's reputation during the middle ages as a magician. The Sibylline oracles also were much used for the same purpose. The practice did not cease with the introduction of Christianity; but instead of Virgil, or, to speak more correctly, together with Virgil, the Bible was thus used to ascertain the future. In place, however, of throwing lines into a 'heathen' urn, it was customary to open the book, as it were accidentally, or to stick a pin between the leaves at hazard, and then open the book—the passage first catching the eye being regarded as pregnant with prophecy of the future welfare. Such lots drawn from Scripture were called, in the middle ages, *Sortes Biblicæ;* as those from Virgil were called *Sortes Virgilianæ.* The custom of using (or abusing) the Bible in this grossly superstitious way still lingers in England, Scotland, and other countries, though more as a frolic of children than aught else. The poet Hafiz is still so used in Persia.

SORTIE, n. *sŏr'tē* [F. *sortie,* a going out—from *sortir,* to go or come out—probably from L. *surgĕrĕ,* to rise: comp. It. *sorto,* risen; *sorgere,* to rise]: sudden outrush

or sally of a beleaguered garrison against their besiegers. See SALLY-PORT.

SORTILEGE, n. *sŏr'tĭ-lĕj* [F. *sortilége*, sorcery—from mid. L. *sortilegĭum*—from L. *sors* or *sortem*, a lot; *lego*, I choose]: divination by drawing lots. SOR'TILE'GIOUS, a. *-lē'jŭs*, pertaining to sortilege.

SORUS, n. *sō'rŭs*, plu. SO'RI, *-rī* [Gr. *sōros*, a heap]: in *bot.*, a cluster of sporangia in ferns. See FERNS.

SOSS, v. *sŏs* [see SOUSE 1]: in *OE.*, to fall lazily into a chair; to sit listlessly and lazily: N. a fall; an idler; in *Scot.*, a mess or mixture. SOS'SING, imp. SOSSED, pp. *sŏst*.

SOSTENUTO, a. ad. *sŏs'tĕ-nô'tō* [It. sustained]: in *music*, a term denoting that a note or a movement is to be somewhat prolonged or sustained to the utmost of the value of the time.

SOT, n. *sŏt* [F. *sot*, dull, gross, sottish: Bret. *sôt*, stupid: Gael. *sotal*, pride, vainglory: Lith. *sotus;* Ger. *satt*, full, satiated]: a person stupefied by excessive drinking; a habitual drunkard; a foolish fellow; a blockhead: V. to stupefy; to tipple to stupidity; to besot. SOT'TING, imp. SOT'TED, pp. SOT'TISH, a. *-tĭsh*, dull; stupid with drink. SOT'TISHLY, ad. *-lĭ*. SOT'TISHNESS, n. *-nĕs*, the state or quality of being sottish.—SYN. of 'sottish': stupid; dull; doltish; senseless; infatuate.

SOTERIOLOGY, *sō-tē-rĭ-ŏl'ō-jĭ* [Gr. *sotērios*, pertaining to salvation; *logos*, discourse]: department of Christian dogmatic theology which treats of man's redemption and salvation through Jesus Christ. See ATONEMENT.

SOTHERN, EDWARD HUGH: American actor, son of E. A. Sothern; b. New Orleans, 1859, Dec. 5. He first appeared with his father in a small part at Abbey's Park Theatre, New York, and became leading man at the Lyceum Theatre in 1887. Shortly thereafter he became a star, appearing at the head of his own company in such plays as *Lord Chumley, Maister of Woodbarrow, Prisoner of Zenda, The King's Musketeers, Lovelace, The Sunken Bell, If I were King, The Proud Prince, The Fool Hath Said in His Heart There Is No God,* and *Hamlet* (1900), occasional revivals since. His interpretation of *Hamlet* is modeled somewhat on that of Edwin Booth, is romantic and effective, but at times prone to exaggeration. In 1896 he married the actress Virginia Harned.

SOTHERN, EDWIN ASKEW: English actor: b. Liverpool, England, 1826, Apr. 1; d. 1881, Jan. 21. In 1849 he joined a company of strolling players, and soon afterward passed into the stock company of the Theatre Royal, Birmingham. From 1852 he appeared in the United States without attracting much attention, until in 1858 *Our American Cousin* was brought out in New York, with Sothern cast for the small part (47 lines) of

Lord Dundreary. Sothern built up the character, making it the leading feature of the play, and one with which his name has ever since been connected. He acted other parts, with more or less success, and was always popular in America, which he frequently visited.

SOTHIC, a. *sŏth'ĭk:* of or pertaining to *Sothis,* the Egyptian name for the dog-star. SOTHIC YEAR, the anc. Egyptian year of 365 days, so named from the Sothis or dog-star, at whose heliacal rising it was supposed to commence: also SOTH'IAC, a. *-ĭ-ăk.* See CALENDAR.

SOTNIA, n. *sŏt'nĭ-a* [Rus.]: a company or squadron in a Cossack regiment.

SOTTO, *sŏt'tō* [It. *sotto,* under, below, beneath]: in *music,* a term denoting below, or more moderate. SOTTO VOCE, *-vō'chā* [It. *voce,* a voice]: with a restrained or moderate voice.

SOU: an old Roman, Gallic, and French coin, of gold, silver, and copper. In France the current 5 centime piece, 20 of which make a franc, are commonly called sous.

SOUARI, or SUWARRO, NUTS: the seeds of the genus *Caryocar Ternstrœmiaceæ,* lofty trees yielding timber prized for its durability, and common in British Guiana. *C. nuciferum* is the chief source of supply of these nuts, having digitate leaves, 5- to 6-parted, large, magenta-colored flowers, and a fruit which is a spherical, hard, woody shell, as large as a child's head, reddish-brown in color, and covered with roundish protuberances. It contains four seeds, the souari nuts, which are kidney-shaped, about the size of an egg, with a ruddy brown shell, that is very hard but has a satiny lining, and encloses a soft, pure white kernel in a brown skin. This rich meat, with its sweet, almond-like flavor, is considered to be the finest of all nuts. A bland oil is expressed from the kernels and they are called butter-nuts in the English market, or cream-nuts in the American. Since there is great difficulty in gathering them, on account of the bulk of the trees, the supply is restricted.

SOUBISE, BENJAMIN DE ROHAN, Seigneur de: French Huguenot soldier: b. Rochelle, France, 1583. He was a son of René II., Vicomte Rohan, and a younger brother of the soldier-writer Henri de Rohan. He served his apprenticeship as a soldier under Maurice of Orange and when the religious wars broke out in 1621 was entrusted with the chief command of the west, while his brother commanded the land forces in the south. In 1625 Soubise made a daring attack on the royalist fleet in the river Balvet, and occupied the island of Oleron. He also commanded in the defense of Rochelle, but was unable to save the town, and when it fell he fled to England.

SOUBAHDAR, n. *sô'bă-dâr* [Hind. *subahdar*—from *subah,* a province, and *dâr,* holding]: in *India,* the governor of a province; the chief native commissioned officer in a sepoy company.

SOUBRETTE, n. *sô-brĕt'* [F.]: a waiting-maid; on the stage, a woman in a comedy, especially a servant-maid, who acts the part of an intrigante; a meddlesome, mischievous young woman.

SOUCHET, n. *sô-shā'* [F.]: the pendulous mucilaginous tubers of *Cyperus esculentus,* cultivated in the s. of Europe, and eaten like nuts. They are sold in the bazaars of Egypt combined with rice in the form of cakes, and, toasted, have been tried as a substitute for coffee. They are nutritive and stimulant; in *cook.,* a dish of Dutch origin in which fish is served in the water or stock in which it is boiled.

SOUCHONG, n. *sô'shŏng* [Chin., little sprouts]: a finer sort of black tea.

SOUDAN', or SOODAN'. See SUDAN.

SOUFFLÉ, n. *sûf'lā* [F.—from *souffler,* to puff; *souffle,* breath, blast]: light, delicate dish, chiefly of beaten whites of eggs, to which other ingredients (chocolate, cheese, vanilla, orange-flower water, rose-water, various essences, etc.) are added to give consistency, flavor, and variety. The materials have to be agitated with a whisk until the whole is in a creamy froth; which is then baked in a soufflé-pan, made of such a form as to fit into a dish or proper holder, that can be sent to table, and quickly handed round. Usually soufflés are sweet; but savory dishes are prepared in the same way, and bear the same name—e.g., potato-soufflé, omelet-soufflé, etc.

SOUGH, n. *sŭf* or *sow* [Icel. *súgr,* a rushing sound: AS. *sweg,* a sighing sound: Scot. *sough* or *souch,* a wailing sound]: a hollow murmuring as of distant waves; a rushing or whistling sound, as of the wind in trees: V. to murmur, as the winds or distant waves; to emit a rushing or whistling sound. SOUGH'ING, imp.: ADJ. sounding; sighing. SOUGHED, pp. *sŭft.*—In *Scot.,* pronounced *sôċh,* with *ch* gutteral.

SOUGH, n. *sŭf* [W. *soch,* a drain]: in *OE.,* a small underground drain.

SOUGHT, v. *sawt:* pt. pp. of SEEK, which see.

SOUKAR, n. *sow'kėr* [Hind. *sahukar*]: a native Indian banker or money-lender. Sometimes called a Marwadi or Marwari, as many native bankers come from the province of Marwar, Rajpootana.

SOUL, n. *sōl* [Goth. *saivala;* AS. *sáwl;* Icel. *sâl;* Ger. *seele,* soul: comp. Gael. *saoil,* to think]: the thinking being in man; that part of man which enables him to think and reason, and which originates and is acted upon by the animal passions; heart; vital principle; essence or chief part; internal power; a living intellectual creature; a human being; spirit; energy or grandeur of mind; disposition or appetite; the inspirer of any action, or leader of an enterprise; used as a familiar appellation for a person, as a poor *soul,* a good *soul.* SOULED, a. *sōld,* instinct with soul or feeling. SOUL'LESS, a. *-lĕs,*

without soul or life; mean; spiritless. SOUL-DESTROYING, a. pernicious; tending to destroy the soul. SOUL-FELT, a deeply felt. SOUL-DISEASED, a. in *OE.*, diseased in mind; soul-sick. SOUL-STIRRING, a. exciting the deep feelings of the heart. SOUL-SUBDUING, a. calming or tempering the deep feeling of the heart.—SYN. of 'soul': mind; spirit; intellect; life; courage; ardor; fire; essence; quintessence.

SOUL: in psychology the term soul has been made equivalent to mind. It has then been thought to be a substantial entity, possessing individuality and identity and having the power to think, feel and will. The use of the word soul in psychology has been kept up in part by the fact that the teaching of psychology has remained until recent years in the hands of persons who were chiefly interested in theology, where it has much more popular usage. Probably, too, because of the place the word occupies in theological doctrine, its use in psychological literature is distinctly on the decline. In theology the word is made to cover the immaterial part of man. It is generally defined negatively and the definition is made to exclude all the qualities that belong to material substances. It is, therefore, not apprehensible by any of the senses—it can be thought about only. It is indestructible, not subject to time and space conditions and is immortal. The term soul even in theological thinking is not easily distinguishable from spirit. Man is sometimes represented as consisting of a body, soul and spirit, sometimes of a body, mind and spirit. In these representations, which are called trichotomy, the theologians seem to shrink from drawing with any clearness the distinctions between mind and soul or between soul and spirit.

The soul doctrine seems to have taken form first among the Egyptians by whom it was applied to the principle of life in both animals and men. This life principle on the theory of transmigration of souls might dwell in the bodies of either animals or men. However, the superior endowment of man soon suggested a distinction between the brute creation and man. This was found in the animal passion and the rational soul. The first were possessed by both and the latter by man alone. The trichotomy of man into a body, soul and spirit followed upon this. Such a threefold division was unfamiliar to the Jewish mind, which had conceived man as a dual being. Although the Jews came into the inheritance of Egyptian culture and by them much of it was handed down to succeeding generations, the doctrine of man's duality, which is known as dichotomy, seems not to have made much headway against the more popular trichotomy until the times of Descartes and Calvin, when man's dual nature was accepted and it has prevailed ever since. The triune character of man is no longer upheld in serious thought. The doctrine apparently survives only in popular and literary phraseology. Some attempt

has been made, though not in a very serious way, to reconcile or harmonize the two doctrines of dichotomy and trichotomy. In this attempt the soul is represented as the meeting place, or perhaps the result of the interaction, of the body and spirit. A man would then have a soul in so far forth as his body and spirit had acted or reacted upon one another. Modern philosophical discussion has busied itself considerably with the relations between body and mind, or perhaps between body and soul—in Germany between Leib and Seele and between Körper and Geist.

SOULE, *sôl,* GIDEON LANE, LL.D.: 1796, July 25—1879, May 28; b. Freeport, Me.: educator. He graduated at Bowdoin College 1818, spent a year in Andover Theol. Seminary, was tutor in Phillips Exeter Acad. 1818-9, in Phillips Andover Acad. 1820-1, became prof. of anc. languages in Phillips Exeter Acad. 1822, and held the chair till 1838, when he succeeded Benjamin Abbot, LL.D., as principal. In 1873, after more than 50 years' continuous service in the acad., he was retired as prof. emeritus. He holds a place among the great Amer. teachers in the middle of the 19th century.

SOULE, JOSHUA, D.D.: 1781, Aug. 1—1867, March 6. Meth. Episc. bp. He was licensed to preach 1798, and was presiding elder in Maine 1804, and subsequently in other districts in that state and Mass., until 1816, when he became editor of the *Methodist Magazine.* After this he had stations in New York and in Baltimore, and was elected bp. 1824. He drafted the plan, at the general conference 1808, for the delegated conference which became a part of the Methodist system. On the secession of the Meth. Episc. Church, South, he removed to Nashville, Tenn.

SOULE, *sô-lā',* PIERRE: American statesman: b. Castillon, France, 1802, September; d. New Orleans, La., 1870, March 26. He received most of his education at Toulouse, having been interrupted in his studies at Bordeaux by an accusation of complicity in a plot against Louis XVIII., in consequence of which he was obliged to flee. Soon after his pardon in 1824 he was again exiled on account of the publication of articles in his paper, *The Yellow Dwarf,* derogatory to the course of the ministers of Charles X., and took up his residence at this time in America. In 1847 he was appointed to the United States Senate from Louisiana to fill a vacancy and in 1849 was elected for the full term. He was extremely radical and was prominent in the debates on the Compromise of 1850. From 1853-5 he was minister to Spain and while at Madrid became notorious as a duelist. He united with Buchanan and Mason in the Ostend manifesto of 1854 regarding the purchase of Cuba. During the Civil War he was a member of Beauregard's staff. At the conclusion of hostilities he took up his law practice in New Orleans.

SOULT, *sôlt*, NICOLAS-JEAN DE DIEU, Duke of Dalmatia, and Marshal of France: 1769, Mar. 29—1851, Nov 26; b. Saint-Amans-la-Bastide, in the dept. of Tarn; son of a notary. In 1785 he enrolled himself as a private in the royal infantry regt.; and so distinguished himself by his steady obedience to discipline, indomitable *sang-froid*, and general intelligence, that 1792 he became adjt.major. His behavior at Fleurus gained for him 1794, Oct. 11, the brevet of gen. of brigade. 1794–99, he was employed on the e. frontier; and in the retreat after the defeat of Stockach 1799, Mar. 25, his able handling of the rear guard alone prevented the annihilation of the French army. Appointed gen. of division 1799, Apr. 21, and put under Massena, whom he ably seconded in Switzerland and Italy, he was afterward, on the warm recommendation of Massena, appointed by Napoleon to one of the four colonelships of the consular guards, and now became an ardent Napoleonist. This devotion, doubtless, was a great aid to his obtaining the bâton of Marshal of France; but he most certainly justified his appointment by his brilliant achievements in the subsequent campaign against the Austrians, closed by the battle of Austerlitz, which he decided by piercing the Russian centre. He did good service also in the Prussian campaign; and took an important though not prominent part in the Russian campaign of 1806–7; after which he was appointed gov. of Berlin, and created Duke of Dalmatia. S. was next placed at the head of the second corps in Spain, pursued the retreating British, attacked them at Coruña, and though repulsed, forced them to leave all their matériel behind. He then conquered Portugal, and exercised vice-regal authority over it; but the sudden arrival of Wellesley at Coimbra, and of Beresford at Chaves, caused his rapid retreat to Galicia. 1809, Sep., he became commander-in-chief in Spain, gained a brilliant victory at Ocana (Nov. 18), and at the beginning of the following year overran and subdued Andalusia, continuing to command in person the southern army. In attempting to succor Badajos, which he had captured and garrisoned (Mar. 11), he was defeated by Beresford at Albuera 1811, May 16. After the battle of Salamanca, and the advance of the British on Madrid, S. became thoroughly disgusted at the rejection of his admirable plans for transferring the theatre of war to Andalusia, and demanded and obtained his recall; but on the news of Vitoria (q.v.) reaching Napoleon, S., whom alone he considered capable of turning the tide of ill-fortune, was, in all haste, restored to the command-in-chief of the army of Spain. Now, however, it was not in Spain but in France that the contest had to be waged; and the advantage of numbers, discipline, and prestige all were on the enemy's side; nevertheless, by a system of military tactics which has been universally admired, S. completely neutralized the consummate strategy of Wellington, and reduced the campaign, during its seven months, to a mere trial of strength—the defeats which he sustained at Orthez and Toulouse being due to the superiority of the British

soldiers, not of their general. With his usual suppleness of character, he became an ardent royalist after the abdication of Napoleon; but on Napoleon's return from Elba, he abandoned Louis XVIII., and became maj.gen. of the imperial army. After Waterloo, he rallied the army at Laon; and July 3d, at the council of war, coincided with Carnot as to the uselessness of further resistance. To avoid the punishment due to his treachery, he published a memoir traducing Napoleon in the basest manner, and lauding the 'lawful princes' (i.e., the Bourbons); but in spite of this he was banished, and not recalled till 1819, May; however, after a few years he was restored to all his former honors, and became active in politics, and in development of French industry. In 1838 he was sent as ambassador to England; and, as the great antagonist of Wellington, was received with great honor. In 1845 he retired from active duty, was honored with the appointment of 'Marshal-general of France,' and retired to his residence of Soultberg, where he died. In the following year, a statue of S., in white marble, was placed in the galleries of Versailles.—See S.'s *Mémoires;* also, Napier's *History of the Peninsular War;* Thiers's *Histoire de la Révolution et de l'Empire;* Salle's *Vie Politique du Maréchal S.* (1834).

SOUND, n. *sownd* [F. *son*—from L. *sonus*, sound: W. *sôn*, noise, report: Bret. *son* or *soun*, sound, tune]: anything perceptible to the ear; that which is audible (see below); noise; report; noise without significance: V. to make a noise; to utter audibly; to play on; to celebrate or extol; to be conveyed in sound. SOUND'ING, imp.: ADJ. sonorous; making a noise: N. the act of one who or that which sounds. SOUND'ED, pp. SOUND'LESS, a. *-lĕs*, without sound. SOUND-BOARD, or SOUNDING-BOARD, the thin plate of metal or wood which increases the sound of a musical instr.; the structure over a pulpit. SOUND-BOW, n. that part of a bell on which the clapper strikes. The sound-bow is the point of the greatest thickness, and is considered as unity in stating the proportions of the bell. SOUNDING-POST, or SOUND-POST, a small post in a violin or similar instr., set under the bridge for support, and for propagating the sound.

SOUND, n. *sownd* [AS. and Icel. *sund*, swimming: Icel. *sund*, a sound or strait: Ger. *sund*, a strait]: narrow passage of water which may be crossed by swimming, or whose depth may be ascertained: a narrow arm of the sea. SOUNDS [in Shetland, those of the cod dried for food are called *soums*]: the swimming-bladders of fish. THE SOUND, on the n. Atlantic coast, Long Island Sound (q.v.). —In n. Europe, one of the sea-passages or straits leading into the Baltic Sea—the Cattegat, between Sweden on the e. and the Danish island of Seeland on the w. It forms the usual passage from the n. to the Baltic Sea, is 40 m. long, and nearly 3 m. broad at its narrowest part, between the towns of Helsingborg and Elsinore. Its entrance is defended by the strong castle and fortress of Kronborg (see

ELSINORE). SOUND DUTIES, certain dues formerly payable to the Danish govt. by all vessels passing the sound or strait separating Sweden from Seeland. These duties originated in an agreement between the king of Denmark and the Hanse Towns 1348, by which the former undertook to maintain the light-houses in the Cattegat, and the latter to pay duty for them. England became bound to pay duty by a treaty of 1450; other countries followed. The Sound Duties were abolished 1857, Mar. 14, by a treaty between Denmark and other powers. A pecuniary compensation of $16,480,538 (nearly one-third contributed by Great Britain) was stipulated to be paid to Denmark, which was to be held bound to maintain the light-houses and superintend the pilotage of the Sound.

SOUND, a. *sownd* [Sw. and Dan. *sund;* Ger. *gesund;* Dut. *gezond;* L. *sanus,* sound, whole: AS. *sund,* sound]: whole; healthy; not diseased; strong; healthy in mind; unbroken; profound; not defective; heavy, as a beating; not decayed; unhurt; correct; free from error; orthodox; not enfeebled: AD. soundly; heartily. SOUND'LY, ad. *-lĭ,* healthily; heartily; stoutly; smartly; truly; rightly; fast; closely. SOUND'NESS, n. *-nĕs,* the state of being sound or firm; entireness; strength; solidity; orthodoxy.—SYN. of 'sound, a.': healthy; hearty; unhurt; right; orthodox; lusty; stout; strong; valid; fast;—of 'soundness': strength; firmness; solidity; rectitude; truth; sanity.

SOUND, v. *sownd* [F. *sonder,* to measure the depth with a plummet—from a supposed L. *subundārĕ,* to go under water—from L. *sub,* under; *unda,* a wave: perhaps the same word as SOUND 2]: to try, as the depth of water and the quality of the bottom, by sinking a plummet attached to a line; to use the line and lead or other means to ascertain the depth of water; to try; to examine; to discover or endeavor to discover, as the thoughts of another: N. in *surg.,* a probe or other instr. used to examine the bladder or a wound. SOUND'ING, imp.: N. the act of throwing the lead to try the depth of water, either for purposes of navigation in piloting a ship among shoals or rocks, for ascertaining her position where the depth and nature of the bottom are previously known, or for constructing a chart, etc. It is done generally by means of a marked line, to which is attached a tapered lead, the bottom or foot of the lead being hollowed to receive some grease or tallow to which a portion of the soil at the bottom of the sea will adhere. Other methods have been devised, such as by a rotating fan-wheel, etc.; but the first method is generally used for ordinary depths. See SOUNDING, DEEP-SEA.—Sounding is also the act of endeavoring to discover the opinions of others. SOUND'ED, pp. SOUND'ABLE, a. *-ă-bl,* capable of being sounded. SOUND'INGS, n. plu. *-ĭngz,* parts of water where the bottom may be reached; the parts brought up from the bottom to show the nature of the ground. SOUND'LESS, a. *-lĕs,* unfathomable. SOUNDING-LINE, a line used to take soundings. SOUNDING-ROD, a rod to ascertain the depth of water in a ship's hold.

SOUND: impression produced on the Ear (q.v.) by vibrations of the surrounding elastic medium, such as air or water. That this is the case is proved, *first,* by the fact that a bell or tuning-fork *in vacuo* gives no S. when struck; *secondly,* by the fact that mere currents, as such (winds, running water, etc.), do not produce the sensation of S. until they are frittered down into vibratory motions by obstacles.

The most untutored ear distinguishes at once between a mere *noise* and a *musical note.* It of course distinguishes a *loud* S. from a faint one. Moreover, it distinguishes musical notes from one another by their shrillness or gravity, or, technically, their *Pitch.* Again, as in the case of vowel-sounds sung to the *same* musical note, or as in the case of different instruments (e.g., flute and violin) playing the same note, the ear distinguishes something further—called the *Timbre* or the *Quality* of the note. It is on the pitch of notes that the Theory of Music (q.v.) is based, for the quality is important only in giving variety—as in orchestral music—or in giving richness of tone in a solo. The most perfect *music,* so far as theory goes, may be executed on the poorest instrument, but it gives little pleasure from lack of richness or quality. In the same way, a singer may possess faultless intonation, yet the performance, though *musically* perfect, may, from the harsh quality of the voice, be unpleasant. Though in this article the intention is to avoid everything connected with music, the above remarks are introduced to show that there is something in the theory of S. more profound than is contemplated in the theory of music.

The questions now to be discussed are:

1. What constitutes the difference between a mere noise and a musical note?
2. On what does the pitch of a note depend?
3. On what does its quality depend?

The answers to these queries all are contained in the following statement:

Every musical note consists in the repetition, at equal minute intervals of time, of some definite noise; the pitch depends on the rate of repetition; and the quality upon the nature of the fundamental noise.

Rough experimental illustrations of the parts of this statement are easily given; more refined ones will be afterward alluded to. If, e.g., the edge of a card be held to a revolving toothed-wheel, a definite sound is produced as each tooth bends the card and allows it to spring back. While the wheel revolves slowly, we can distinguish these successive noises; but when it is revolving so fast that they are no longer separately distinguishable, the character of the S. changes completely. It now becomes continuous, and, so far as the ear can detect, uniform, and thus becomes a musical note (with such an apparatus, not a pleasing one). As the wheel is made to revolve faster and faster, the pitch of the note rises, till it becomes a sort of shriek, and finally becomes inaudible. The *Siren* (q.v.) gives another excellent illustration. In this case the fun-

damental noise is produced by a puff of air escaping from an orifice; and we observe, just as above, that the greater the number of such puffs per second, after they have become so frequent as to be separately indistinguishable, the higher is the pitch of the musical note produced.

Now, if by machinery we arrange matters so that the siren and the toothed-wheel give the number of puffs and the number of impacts on the card the same per second, the musical note produced by each has the same pitch. But the notes differ greatly in quality, the one being exceedingly soft and pleasant, the other harsh and grating. The pitch, therefore, depends on the number of noises per second, and the quality upon the nature of the fundamental noise. We shall find a complete theoretical proof of this later.

For an account of the mechanical process by which S. is propagated in the air, and a comparison of S. with other cases of wave motion, see WAVE. Meanwhile, it is necessary for us to observe only that, as the velocity of S. is ten times greater than that of wind in the most violent hurricane, it is not *air* itself which is transferred from place to place, but a *state of disturbance* (condensation or rarefaction) of the air. Each successive layer of air in the path of the S. suffers this disturbance in turn, and, by virtue of its Elasticity (q.v.), passes it on to the next.

Newton was the first who attempted to deduce from mechanical principles the velocity of S., but only for the particular case in which each particle of air, in the path of the S., is supposed to move forward and backward, according to the same law as the bob of a Pendulum (q.v). He showed that this species of motion is consistent with the elastic properties of air, as given by Boyle's or Mariottes' Law (q.v.), viz., that the pressure of air is proportional to its density. The velocity of S. in this case is of course to be found from the time which elapses between the commencement of the motion of any one particle of air, and that of another at a given distance from it, in the direction in which the S. is moving. The numerical result deduced by Newton with the then received experimental data for the compressibility of air, was 979 ft. per second. This investigation was very defective, applying, in fact, solely to the special case of a pure musical note, continually propagated without lateral divergence; yet the solution obtained by Lagrange from a complete analysis of the question gave precisely the same mathematical result.

But, by direct measurements, carefully made, by observing at night the interval which elapses between the flash and the report of a cannon at a known distance, the velocity of S. has been found to be considerably greater—in fact, about 1,090 ft. per second, at the temperature of freezing water.

Newton seeks for the cause of this discrepancy between theory and observation in the idea that the size of the particles of air is finite compared with their mutual distance; and that S. is instantaneously propagated through the particles themselves. Thus, supposing the particles to have a diameter $\frac{1}{9}$ of the distance between them, we must add

$\frac{1}{9}$ to the space travelled by S. in a second, i.e., to the velocity—which will thus be brought up to $1\frac{1}{9}$ times 979 ft. = 1,088 ft. nearly, a close approximation to the actual value given above.

This is not one of Newton's happiest conjectures—for, independent of the fact that such an assumption would limit definitely the amount of compression which air could undergo, and, besides, is quite inconsistent with the truth of Boyle's law for even moderate pressures, it would result from it that S. should travel slower in rarefied, and quicker in condensed air. Now, experiment shows that the velocity of S. is unaffected by the height of the barometer; indeed, it is easy to see that this ought to be the case. For in condensed air the pressures are increased proportionally to the increase of condensation, and the mass of a given bulk of air is increased in the same proportion. Hence, in a S.-wave in condensed air, the forces and the masses are increased proportionally, and thus the rate of motion is unaltered. But the temperature of the air *has* an effect on S., since we know that the elastic force is increased by heat, even when the density is not diminished; therefore the velocity of S. increases with the temperature at the rate of about $4\frac{1}{2}$ ft. per Fahrenheit degree, as is found by experiment.

Newton's explanation of the discrepancy between theory and experiment being thus set aside, various suggestions were made to account for it; some, among whom was Euler, imagining that the mathematical methods employed, being only approximate, involved a serious error.

The explanation was given finally by Laplace, and is simple and satisfactory. When air is *suddenly* compressed (as it is by the passage of a S.-wave), it is heated; when suddenly rarefied, it is cooled, and this effect is large enough to introduce a serious modification into the mathematical investigations. The effect is in either case to *increase* the forces at work; for, when compressed, and consequently heated, the pressure is greater than that due to the mere compression; and, when rarefied, and consequently cooled, the pressure is diminished by more than the amount due to the mere rarefaction. When this source of error is removed, the mathematical investigation gives a result as nearly agreeing with that of observation as is consistent with the unavoidable errors of all experimental data. It is to be observed that, in noticing this investigation, nothing has been said as to the pitch or quality of the S., for these have nothing to do with the velocity. It must, however, be remarked here that, in the mathematical investigation, the compressions and rarefactions are assumed to be very small; i.e., the S. is supposed to be of moderate intensity. It does not follow, therefore, that very violent sounds have the same velocity as moderate ones, and many curious observations made during thunder-storms seem to show that such violent sounds are propagated with a greatly increased velocity. (See a paper by Earnshaw in the *Phil. Mag.* 1861.) It is recorded that in one of Parry's arctic voyages, during gun-practice, the officer's command

'Fire' was heard at great distances across the ice *after* the report of the gun. The propagation of S. is not retarded but rather favored by the presence of snow, rain, or fog in the atmosphere; perfect stillness and a uniform temperature and uniform density are also conditions favoring the propagation of S.-waves. A S is sometimes conveyed better athwart a wind or against a wind than in the same direction with it.

Since S. consists in a wave-propagation, we should expect to find it exhibiting all the ordinary phenomena of Waves (q.v.). Thus, e.g., it is *reflected* (see ECHO) according to the same law as light. It is *refracted* in passing from one medium to another of different density or elasticity: this has been proved by concentrating in a focus the feeble S. of the ticking of a watch, and rendering it audible at a considerable distance, by means of a convex lens of collodion films filled with carbonic acid gas. S. is refracted also by wind: when it has the same direction as the wind, it is refracted earthward; when it takes the opposite direction it is refracted upward: thus a S. inaudible on the deck of a ship to windward of the source of S. may be distinctly audible at the masthead. Difference of temperature is also a cause of refraction of sounds: when the lower atmosphere is warmer S.-waves are tilted up; when it is colder S.-waves are refracted to the earth's surface.

Sounds *interfere* to reinforce each other, or to produce silence; just as the crest of one wave in water may be superposed on the crest of another, or may apparently destroy all motion by filling up its trough. The simplest mode of showing this is to hold near the ear a vibrating tuning-fork and turn it slowly round its axis. In some positions, the sounds from the two branches reinforce, in others they weaken, each other. But if, while the S. is almost inaudible, an obstacle be interposed between the ear and one of the branches, the S. is heard distinctly. Beats, alluded to below, form another excellent instance.

To give an idea of the diminution of loudness or intensity of a S. at a distance from its source, let us consider a series of spherical waves diverging from a point. The *length* of a wave, as we know from the theory, does not alter as it proceeds. (Indeed, as we shall presently see, the pitch of a note depends on the length of the wave; and we know that the pitch is not altered by distance.) Hence, if we consider any one spherical wave, it will increase in radius with the velocity of S., but its thickness will remain unaltered. The same disturbance is thus constantly transferred to masses of air greater and greater in proportion to the *surface* of the spherical wave; therefore the amount in a given bulk (say a cubic inch) of air will be inversely proportional to this surface. But the surfaces of Spheres (q.v.) are as the squares of their radii—hence the disturbance in a given mass of air, i.e., the loudness of the S., is inversely as the square of the distance from the source. This follows at once from the law of conservation of energy (see FORCE), if we neglect the portion which is constantly being frittered down into heat by fluid friction. All sounds

even in the open air, much more rapidly in rooms, are extinguished ultimately by conversion into an equivalent of heat. Hence sounds really diminish in intensity at a greater rate than that of the inverse square of the distance; though there are cases on record in which sounds have been heard at distances of nearly 200 m. But if, as in speaking-tubes and in speaking-trumpets, S. be prevented from diverging in spherical waves, the intensity is diminished only by fluid friction, and thus the S. is audible at a much greater distance, but of course it is confined mainly to a particular direction.

As already remarked, the purest sounds are those given by a tuning-fork, which (by the laws of the vibration of elastic solids) vibrates according to the same law as a pendulum, and communicates exactly the same mode of vibration to the air. If two precisely similar tuning-forks be vibrating with equal energy beside each other, we may have either a S. of double the intensity, or anything less, down to perfect silence, according to their relative *phases*. If the branches of both be at their greatest elongations simultaneously, we have a doubled intensity—if one be at its widest, and the other at its narrowest, simultaneously, we have silence, for the condensation produced by one is exactly annihilated by the rarefaction produced by the other, and *vice versâ*. But if the branches of one be loaded with a little wax, so as to make its oscillations slightly slower, it will gradually fall behind the other in its motion, and we shall have in succession every grade of intensity from the double of either S. to silence. The effect will be a periodic swelling and dying away of the S., and this period will be longer the more nearly the two forks vibrate in the same time. This phenomenon is called a *beat*, and we see at once from what precedes, that it affords an admirable criterion of a perfect *unison*, that is, of two notes whose pitch is the same. It is easy to see, by the same kind of reasoning, that if two forks have their times of vibration nearly as 1 : 2, 2 : 3, etc.—i.e., any simple numerical ratio—there will be greater intervals between the beats according as the exact ratio is more nearly arrived at.

We must now consider, so far as can be done by elementary reasoning, the various simple modes of vibration of a stretched string, such as the cord of a violin. Holding one end of a rope in the hand, the other end being fixed to a wall, one can easily (after a little practice) throw it into any of the forms illustrated in figs. 1–5, the whole preserving its shape, but rotating round the horizontal line. If the tension of the rope be the same in all these cases, it is easy to see that the times of rotation must be inversely as the number of equal segments into which the rope is divided; for the various parts will obviously have the same form; and the masses and distances from the axis of rotation being proportional to their lengths, the Centrifugal Forces (q.v.) will be as the squares of the lengths, and inversely as the squares of the times of rotation. But these centrifugal forces are balanced by the components of the tensions at the extremities.

in directions perpendicular to the horizontal line; which are, by hypothesis, the same for all the figures. Hence the time of rotation is directly as the length of each segment. Now (see PENDULUM) any such rotation is equivalent to two mutually perpendicular and independent pendulum vibrations of the cord from side to side of the

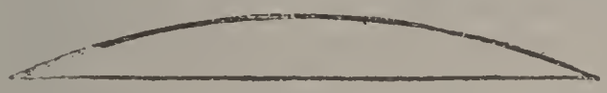


Fig. 1.

Fig. 2.

Fig. 3

Fig. 4.

Fig. 5.

horizontal line. Thus, a violin-string may vibrate, according to the pendulum law, in one plane, either as a *whole* (fig. 1), as *two halves* (fig. 2), as *three thirds* (fig. 3.), etc.; and the times of vib[illegible]n are respectively as 1, $\frac{1}{2}$, $\frac{1}{3}$. . . . Nay, more, any two or more of these may coexist in the same string, and thus, by different modes of bowing, we may obtain very different combinations of simple sounds: a *simple sound* being defined as that produced by a single pendulum motion, such as that of a tuning-fork, or one of the uncomplicated modes of vibration of a string.

The various simple sounds which can be obtained from a string are called *Harmonics* of the fundamental note; the latter being the sound given by the string when vibrating as a whole (fig. 1). For each vibration of the fundamental note, the harmonics have two, three, four, etc. Of these, the first is the octave of the fundamental note; the second the twelfth, or the fifth of the octave; the third the double octave; and so on. Thus, if we have a string whose fundamental note is C, the series of simple sounds it is capable of yielding is:

$$C, C_1, G_1, C_2, E_2, G_2 (B\flat_2), C_3, D_3, E_3, \text{etc.}$$

Of those written, all belong to the ordinary musical scale except the seventh, which is too flat to be used in music. Facts such as are indicated in this passing remark are by many cited as showing how artificial is the theory of music, founded not on a physical, but on a sensuous basis.

To produce any one of these harmonics with ease from a violin-string, we have only to touch it lightly at $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, etc., of its length from either end and bow as usual. This process is frequent with musicians, giving a curious and pleasing effect with the violoncello or the double-bass. The effect of the finger is to reduce to rest the point of

the string touched; and thus to make it a point of no vibration, or technically a *Node.*

In the case of a pianoforte wire (see PIANOFORTE), a blow is given near one end, producing a displacement which runs forward and back along the wire in the time in which the wire would vibrate as a whole. The successive impacts of this wave on the ends of the wire (which are screwed to the sounding-board) are the principal cause of the S.: but more of this case later.

The theory of other musical instruments is quite as simple. Thus, in a flute, or unstopped organ-pipe (see ORGAN), the S is produced by a current of air passing across an orifice at the closed end. This produces a wave which runs along the tube, is reflected at the open end, runs back, and partially intercepts the stream of air for an instant: and so on. Thus the stream of air is intercepted at regular intervals of time, and we have the same result as in the Siren (q.v.). In this case, there is *one* node only, viz., at the middle of the pipe. If we blow more sharply, we create two nodes, each distant from an end by $\frac{1}{4}$ of the length of the tube. The interruptions are now twice as frequent, and we have the first harmonic of the fundamental note. And so on—the series of harmonics being the same as for a string. We may easily pass from this to the case of an organ-pipe closed at the upper end. For if, while the open pipe is sounding its fundamental note, a diaphragm is placed at the node, it will not interfere with the motion, *since the air is at rest at a node.* Thus the fundamental note of a closed pipe is the same as that of an open pipe of double the length. By examining the other cases in the same way, we find that the number of vibrations in the various notes of a closed pipe are in the proportions 1 : 3 : 5 : 7 : etc. the even harmonics being wholly absent.

There is another kind of organ-pipe, called a reed-pipe, in which a stream of air sets a little spring in vibration so as to open and close, alternately, an opening in the pipe. If the spring naturally vibrates in the time corresponding to any harmonic of the pipe, that note comes out with singular distinctness from the combination—just as the S. of a tuning-fork is strongly reinforced by holding it over the mouth-hole of a flute which is fingered for the note of the fork. If the spring and the tube have no vibration in common, the noise produced is intolerably discordant. The Oboe, Bassoon, and Clarionet are mere modifications of the reed-pipe; so are Horns in general; but in them the reed is supplied by the lip of the performer: thus a Cornet, a Trumpet, or a French Horn, gives precisely the same series of harmonics as an open pipe.

The statements just now made as to the position of the nodes in a vibrating column of air are not strictly accurate, for the note is always found to be somewhat *lower* than that which is calculated from the length of the tube and the velocity of sound. Hopkins showed experimentally that the distance between two nodes is always *greater* than twice the distance from the open end to the nearest

node. The mathematical difficulties involved in a complete investigation of the problem were first overcome by Helmholtz 1859: see an admirable paper in *Crelle's Journal* The results are found to be in satisfactory accordance with those previously derived from experiment.

We have now to consider the subject of the quality of musical sounds; and one of its most important branches—what constitutes the distinction between the various vowel sounds. It had long been recognized that the only possible cause of this distinction between sounds *musically identical* must be in the nature of the fundamental noise; or, to express it differently, in the nature of the periodic motion of each particle of air. But it appears that Helmholtz was the first to enter on a complete examination of the point, both mathematically and experimentally; and his results are among the remarkable contents of his excellent work, *Sensations of Tone* (*Die Lehre von den Tonempfindungen*).

It was established by Fourier, that any periodic expression whatever may be resolved into the sum of a number of simple harmonic terms, whose periods are, respectively, that of the original expression, its half, its third part, etc. Hence any periodic motion of air (i.e., any musical S.) may be resolved into a series of simple pendulum vibrations (i.e., pure musical sounds, such as those of tuning-forks); the first vibrating once in the given period, the second twice, and so on. These notes are, as we have seen, the several harmonics of the lowest. Hence the quality of a musical S. depends on the number and loudness of the harmonics by which it is accompanied.

Two experimental methods were employed by Helmholtz, one analytical, the other synthetical. In the first he made use of resonance-cavities fitted to the ear, and giving scarcely any indication of external sounds until one is produced which exactly corresponds in pitch with the note which the cavity itself would yield. With a series of such cavities, tuned to the several harmonics of some definite note, the note was examined when played on various instruments, and when sung to different vowel-sounds: it was thus ascertained which harmonics were in each case present, and to what extent, producing the particular quality of the sound analyzed. The second method was founded on the fact, above noticed, that a tuning-fork gives an almost pure musical S. (i.e., free from harmonics). A series of tuning-forks, giving a note and its harmonics, were so arranged as to be kept constantly in vibration by an electric-magnetic apparatus. Opposite to each was fixed a resonance-cavity exactly tuned to it, and capable of being opened more or less at pleasure. When all the cavities were shut, the S. was scarcely audible; so that by opening them in various ways, any combination of harmonics might be made to accompany the fundamental note. These combinations were varied by trial, until the quality of the resultant S. was brought to represent as nearly as possible that of some vowel. The results of this second series of experiments coincided with those of the

first. It appears from these investigations that the German U is the quality of a simple sound, though improved by adding faintly the two lowest harmonics; that O depends mainly on the presence of the third harmonic; and so on with the other sounds. It appears also, and it is well known by experience, that different vowel-sounds, to be sung with accuracy, require to be sung to different notes, the proper note being that for which the cavity of the mouth is adapted for production of the accompanying harmonics which determine the quality of the particular vowel.

In strings and pipes, as we have seen, the higher notes are strictly harmonics of the fundamental note; therefore the sounds of instruments which depend on these simple elements are peculiarly adapted for music. On the other hand, when, as in masses of metal, etc., the higher notes are not harmonics of the fundamental note, the mixed S. is always more or less jarring and discordant. Such is the case with bells, trumpets, cymbals, triangles, etc.; and, in fact, these sounds are commonly characterized as 'metallic.' To produce from such instruments a S. as pleasing as possible, they must be so struck that as few as possible of the higher notes are produced, and these as feebly as possible. Thus, e.g., to get the most pleasing S. from a pianoforte-wire, the stroke should be not at the middle, as in such a case the first, third, fifth, etc., harmonics of the fundamental note will be lacking. If, however, it be struck at about $\frac{1}{7}$ of its length from one end, the harmonics produced will be mainly the first five; and these all belong to the chord of the fundamental note.

On the general subject of S., see ACOUSTICS: also consult Tyndall, *Lectures on Sound;* Helmholtz, *Sensations of Tone;* Ganot, *Physics.*—For a recent theory contravening the standard statements of the Undulatory Theory, see SUBSTANTIALISM.

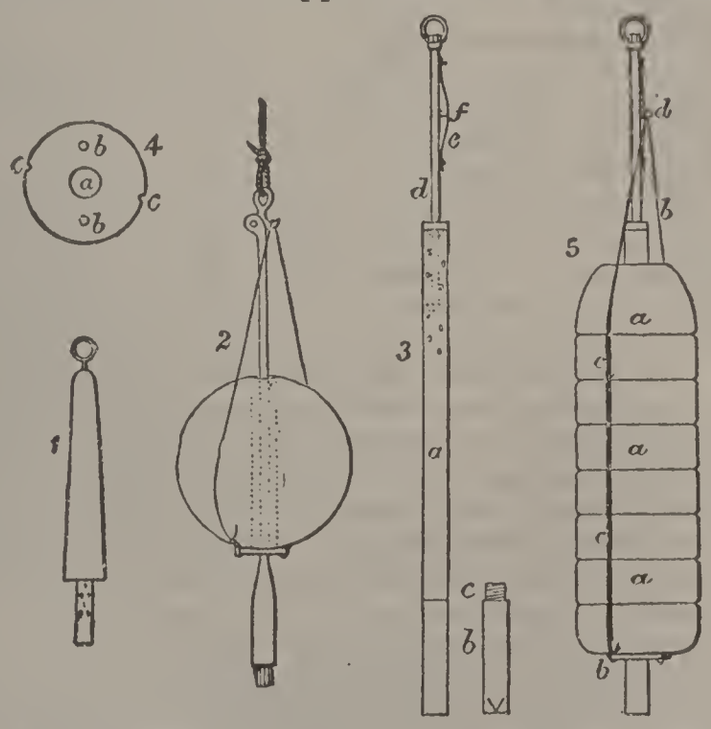
SOUND'ING, DEEP-SEA: exploration of the ocean-bed at great depths: its object is mainly to ascertain the contours of the sea-bottom, and so to determine feasible routes for submarine electric cables: such soundings are made also for purely scientific purposes, as determining problems of biology, physiography, etc. In deep-sea S. the temperature of the sea is taken at the bottom and at intermediate depths by means of a registering thermometer of special construction.

The act of obtaining a deep-sea S. may be said to consist of two parts—1. To cause the sinkers to reach the bottom as quickly as possible with the line straight up and down; 2. To bring a portion of the soil of the bottom, as a proof, to the surface; this necessitates the use of a small but strong line, with heavy sinkers and a detaching apparatus for freeing the sinkers when they reach the bottom; as from the smallness of the line and the great friction of all passing through the water, the strain of bringing the sinkers up would be too great for its strength. There is no difficulty in obtaining a S., and regaining the sinker, with bottom specimen, as far as a depth of 1,000 to 1,200 fathoms

(1½ m.), by means of a heavy lead fitted with a valved tube (fig. 1); but for a depth beyond 2,000 fathoms, the difficulties in obtaining correct S. increase in compound ratio with the depth.

The first detaching apparatus (fig. 2), was devised by Brooke, midshipman of the U. S. navy: it is extremely simple and efficient. It consists of a rod with a movable hook at the upper end, and a tube at the lower end. The sinker is a perforated shot, through which the tube passes, and by means of a ring below the shot the weight is suspended to the hook by wire, the hook being kept up by the sounding-line; the tube is filled with cut quills. When the weight touches the ground, the line is slackened, the hook falls, and the suspending wire being freed, the shot slides off; while the quills, being thrust into the soil, secure a small portion, which is brought up with the rod.

Many different kinds of detaching apparatus have been invented since, but that made use of on the British govt. vessel *Challenger*, in her deep-sea exploration voyage, is but a modification of the original Brooke's machine. The Hydra machine (fig. 3) consists of a tube of iron, 2½ inches in diameter, 4½ft. in length, *a;* the lower 12 inches, *b*, is separate from, but screws to the upper part at *c;* it is fitted with a butterfly valve at the lower end, to retain the bottom specimen. At the upper end of the tube is a piston-



rod *d*, which moves freely in the tube. To the upper part of this rod is fixed a steel spring, bent in a bow *e;* a slit in the spring is adapted to the hook *f*, which protrudes beyond the spring when the latter is forced back. The sinkers (fig. 4) are cast-iron disks of half a cwt. each, the hole through the centre, *a*, being sufficiently large for the sounding-tube to pass through. They are made to fit each other by means of small conical protuberances on the one side, and corresponding hollows on the other, *b;* so

that when placed one on another, the groove *c* in the one weight corresponds to that on the other. The upper and lower sinkers differ a little in form.

When a S. is to be taken, the machine is prepared as in fig. 5, a wooden stand being used for the purpose. The sinkers, *a*, *a*, are piled to the required weight, say 400–500 lbs. (but with a wire line a weight of 50–60 lbs. suffices); the tube is then passed through them, and an iron ring (with a bight of iron wire attached), *bb*, is passed on the lower end of the tube, and the wire led along the continuous grooves on each side of the sinkers *c*, and the bight passed over the hook *d*, the spring being pressed back. When the weight of the sinkers rests on the ring, and is supported by the wire, the weight keeps the spring pressed in; but as soon as the sinkers touch the ground, and the weight is relieved from the wire, the spring throws it off the hook, and the tube is drawn clear through the sinkers.

When the tube, with sinkers complete, is ready, it is carefully hoisted over the side, lowered gently into the sea, and eased down one or two hundred fathoms before being let go. It is then let go, and the passing of each 100 fathoms mark is timed and recorded in a printed form made to contain all the particulars of the sounding.

Instead of a hempen line, a wire is now universally employed in deep-sea S.; this method was introduced by Sir William Thomson.

Many very deep soundings are on record, but the two deepest well-authenticated are among those obtained by the *Challenger*. The first was about 80 m. n. of the Virgin Islands, the depth being 3,875 fathoms, nearly 4½ m. Unfortunately, not thinking that so near the island so great a depth would be found, only 3 cwts. of sinkers were used (the usual quantity for such extreme depths being 4 cwts.); this weight, with a one inch line, took 1 hour and 12 minutes to reach the bottom. As the ascertainment of the sinkers reaching the bottom depends on the time intervals, it is to be noted that the line let free to run with this weight would take about 43 seconds running out the first 100 fathoms, and the time increases as nearly as possible three seconds for each successive 100 fathoms; so that when the interval is prolonged beyond this rate, the sinker has reached the bottom. On this occasion the last 50 fathoms ran out at the rate of 2 minutes 36 seconds per 100 fathoms. The other was n. of New Guinea, where the depth was 4,475 fathoms, more than 5 miles.

An idea of the average depth of the n. Atlantic may be had from the fact that of 108 soundings obtained by the *Challenger*, 48 were between 1,000 and 2,000 fathoms, 56 between 2,000 and 3,000, while only the other 4 exceeded 3,000.

SOUP, n. *sôp* [F. *soupe*, broth: Sw. *soppa*, a sop: Icel. *supa*, to sup up liquids (see SOP)]: kind of rich broth with flesh as an ingredient. SOUP-KITCHEN, establishment supported by voluntary contributions for preparing and supplying soup to the poor. SOUP-PLATE, deep plate in which soup is served at table. SOUPE MAIGRE, n. *sôp mā'gr* [F. *soupe*, soup; *maigre*, thin, lean]: soup made with vegetables, with a little butter and condiments; herb or fish soup —*Soup* is a liquid form of food, obtained from flesh and vegetables, or from vege ables alone; and sometimes from fish.

A notion of what *Soup* really is, and what relation it bears to the solid ingredients which enter into its composition, is afforded by the researches of Liebig. When finely chopped muscular flesh (or butcher-meat) is lixiviated with cold water, and exposed to pressure, there is left a white fibrous residue consisting of muscular fibres, of connective or areolar tissue, and of vessels and nerves. This lixiviated flesh is of precisely the same quality from whatever animal it is obtained, communicates no flavor to water in which it is boiled, cannot be masticated, and, as Liebig observes, 'even dogs reject it.' When the cold water has taken up all that it is capable of extracting, it is found that it has dissolved 16–24 per cent. of the dry chopped flesh. This watery infusion contains all the savory and much of the nutrient matter of the flesh, and is usually of reddish tint, from the presence of a little of the coloring matter of the blood. On gradually heating it to the boiling-point, the albumen of the flesh (varying in amount from 2 to 14 per cent. according as the animal was old or young) separates in nearly colorless flakes when the temperature has risen to 133° F., while the coloring-matter of the blood does not coagulate till the temperature rises to 158° F. The liquid is now clear, and of pale yellowish tint; and as it reddens litmus-paper, it must contain a free acid. The infusion of flesh thus prepared has the aromatic taste and all the properties of a S. made by boiling the flesh. When evaporated, it becomes darker colored, and finally brown; and on ceasing to lose weight, there is obtained a brown, somewhat soft mass of 'Extract of Flesh,' amounting to about 12 per cent. of the weight of the original flesh, supposed to be dried. 'This extract,' says Liebig, 'is easily soluble in cold water, and when dissolved in about 32 parts of hot water, with the addition of some salt, gives to this water the taste and all the peculiar properties of an excellent S. The intensity of the flavor of the dry extract of flesh is very great; none of the means employed in the kitchen is comparable to it in point of flavoring power.' The S. thus made of the flesh of different animals (e g., the ox and the fowl) possesses, with the general flavor common to all soups, a peculiar taste, which distinctly recalls the smell or taste of the roasted flesh of the animal employed. To obtain the strongest and best-flavored S., chopped flesh should be slowly heated to boiling with an equal weight of water; the boiling should be continued only a few minutes

(for prolonged boiling only gives rise to formation of gelatine, a substance of no nutrient value, from the connective tissue of the flesh), and the S. should be then strained off from the solid residue. As a matter of economy, it is often desirable that the meat should be left in an eatable state, which is not the case when S. is made according to the preceding directions. To attain this end, the joint or mass of flesh should be set on the fire with cold water, which should be gently heated to boiling; the flesh thus undergoes a loss of soluble and savory matters, while the S. becomes richer in them. The thinner the piece of flesh, the greater the loss. Hence the method of boiling which yields the best S. gives the dryest, toughest, and most tasteless meat. 'The juice of flesh,' says Liebig, 'contains the food of the muscles; the muscular system is the source of all the manifestations of force in the animal body; and in this sense we may regard the juice of flesh as the proximate condition of the production of force. S. is the medicine of the convalescent, and as a means of restoring the exhausted strength it cannot be replaced by any article of the Pharmacopœia. Its vivifying and restoring action on the appetite, on the digestive organs, the color, and the general appearances of the sick, is most striking.'—See NUTRITION.

Most soups contain an admixture of meat and vegetables in their preparation; but many good soups can be made either entirely without flesh, or with fish instead of flesh. In the former class is pea-S. (which is, however, much improved if a piece of bacon enters into its composition), green-pea S., carrot-S., potato-S., asparagus-S.; while for fish-S., pike, tench, and eels are specially used. The basis of all good soups, except those in the preceding category, is *stock*, or broth made from all sorts of meat, bones, remains of poultry or game, etc., put together and stewed in the *stock-pot*.—See BROTH: MEAT-EXTRACT: BEEF-TEA.

SOUR, a. *sowr* [AS. *sûr;* Ger. *sauer;* Icel. *súrr;* Dan. *suur;* Dut. *zuur;* W. *sûr*, sour]: acid; having a pungent taste; harsh of temper or disposition; morose; turned, as milk: N. in *OE.*, an acid substance: V. to make or become acid; to cause to have a sharp taste; to acquire the quality of tartness; to make harsh in temper; to become crabbed or peevish; to make discontented; to embitter. SOUR'ING, imp. SOURED, pp. *sowrd.* SOUR'LY, ad. *-lĭ.* SOUR'NESS, n. *-nĕs*, acidity; sharpness to the taste; harshness of temper; asperity. SOUR'ISH, a. *-ĭsh*, somewhat sour. SOUR-DOCK, sorrel, which see. SOUR-KROUT, *-krowt*, sauerkraut, which see. SOUR GRAPES, things we depreciate and despise simply because they are beyond our reach—from Æsop's fable of the Fox and the Grapes.—SYN. of 'sour, a.': sharp; acid; tart; harsh; crabbed; acetose; acetous; acrimonious; dogged; peevish; currish; austere; acrid; pungent; morose; severe; afflictive; painful; bitter.

SOURCE, n. *sōrs* [F. *source,* a spring: F. *sourdre;* Prov. *sorzer;* It. *sorgere,* to rise, to bubble up as water —from L. *surgĕrĕ,* to rise]: the spring or fountain from which a stream of water flows; first cause; first producer; original; the person or that which gives rise to anything.—SYN.: beginning; commencement; origin; original; rise; reason; cause; spring; fountain; head.

SOUR'LAKE, or SOUR LAKE: city in Hardin co., Tex.; about 20 m. n.w. of Beaumont, in an agricultural region and a section rich in oil. For several years Sourlake was a health resort, taking its name from springs which possessed medicinal properties. In 1902-3 prospectors began to sink oil test-wells in the pine forests around the springs, with the result that oil in large quantities was found. So many derricks were erected in rows so closely together, that one portion of the oil-field was called the 'Shoestring district.' Sourlake was at once connected with Beaumont and Port Arthur by pipe lines until such time as its own storage buildings were ready for use. Considerable of the oil is sent direct to refineries. The first part of the year 1902, Sourlake was a stretch of prairie at the edge of a pine forest; 1903 saw it a village of about 200 inhabitants with some visitors to the springs. Jan. 1904 the population was about 10,000.

SOURSOP: the edible fruit of *Anona muricata,* a small, much-branched, ornamental tree, cultivated in the East and West Indies. This fruit is large, pear-shaped, covered with soft prickles, greenish in hue outside, but containing a white succulent pulp, with an odor suggesting black currants, and a peculiar, but pleasant, subacid taste.

SOUSA, JOHN PHILIP: American musician; b. Washington, D. C., 1854, Nov. 6. His musical talents were so early developed that he was a band-leader at 17. His wider fame began with his leadership of the U. S. Marine Corps band in 1880-92, and became national with the organization of the band which was known by his name in 1892, and which later made concert tours of the principal European cities. He is the author of numerous musical compositions, but is best known as a composer of popular marches.

SOUSA, or SOUZA, MARTIM AFFONSO DE: Portuguese colonist and governor in South America; b. Bragança about 1500; d. Lisbon 1564, July 21. In 1530 Sousa, an army officer, was despatched in command of a fleet of five sail with a force of 500 to colonize Brazil. The commonly-received statement is that he discovered the bay which is supposed to be the mouth of a river and named Rio de Janeiro, 1531, Jan. 1. But there is some doubt as to whether he was in the bay on that date, and there are records of earlier visits by others. On Jan. 22, 1532, he founded at São Vicente the first Portuguese colony in Brazil. There he introduced the sugar-cane, which he had brought from Madeira, and built the

first sugar-mill in the country. In 1533 he was recalled, and in 1534 made captain of São Vicente, whose affairs he continued to administer, though he did not again visit it. He was admiral of the seas of India in 1534-40, and governor of the Portuguese East Indies in 1542-5.

SOUSE, v. *sows* [prov. Eng. *soss,* a place wet and dirty: Scot. *soss,* the flat sound of a heavy soft body falling on the ground: Norw. *sussla,* to dabble in the mud]: to plunge suddenly, or make a sudden plunge, into water; in *OE.,* to strike with sudden violence, as a bird its prey; to fall on its prey with a swoop, as a bird: N. in *OE.,* a violent attack, as a bird striking its prey: AD. all at once; on a sudden. SOUS'ING, imp.: N. a plunge over head and ears in water. SOUSED, pp. *sowst.*

SOUSE, n. *sows* [OF. *sause;* F. *sauce,* sauce—from L. *salsus,* salted (see SAUCE)]: pickle made with salt; something kept in pickle; the pickled ears, feet, etc., of swine: V. to soak or steep in pickle. SOUS'ING, imp. SOUSED, pp.

SOUTANE, n. *sô-tân'* [F. *soutane;* It. *sottana,* a cassock—from mid. L. *subtana,* a clerical cloak—from L. *subtus,* underneath]: long close black garment (called also Cassock) worn in civil life (commonly with a flowing overdress or robe) by Roman Catholic ecclesiastics, when the strict law of clerical costume is in force: also ordered to be worn under the priestly robes used in the public ministerial offices of the clergyman. The same garment, known as Cassock, is worn by many Protestant Episcopal priests.—In the Roman Church it is not peculiar to bishops, priests, or even clerics in holy orders, but may be worn by all who have received even the TONSURE. Indeed, the Council of Trent declares that no cleric shall be held entitled to the 'privilege of clerics' unless he shall wear the soutane. The ordinary material is serge or woolen cloth; but it is often of more precious stuffs. The color for the secular clergy is commonly black; but dignitaries wear other colors. Thus the pope wears white—cardinals, red—bishops, violet—many canons, blue; and in religious orders and collegiate bodies the color is regulated by special laws. Formerly its obligatory use was general.

SOUTER, n. *sô'tėr* [L. *sutor,* a shoemaker—from *suo,* I sew]: in *Scot.,* a cobbler; a shoemaker.

SOUTH, n. *sowth* [AS. *sûth;* Dut. *zuid;* Ger. *süd;* Icel. *sudr;* Sw. and Dan. *syd,* south]: one of the four cardinal points; the direction opposite to the north: ADJ. being in the south: AD. toward the south. SOUTHEAST, n. the direction between south and east: ADJ. in the direction of or coming from the southeast. SOUTHEASTERLY, a. proceeding from or going to the southeast. SOUTHEASTERN, a. toward the southeast. SOUTHERLY, a. *sŭth'ėr-lĭ,* coming from or going to the south, or to a point nearly south. SOUTH'ERN, a. *-ėrn,* lying toward the south. SOUTH'ERNER, n. *-ėr,* or SOUTH'RON, n. *-rŏn,*

an inhabitant of the more southern parts of a country; in *Scot.*, an Englishman. SOUTH'ERNMOST, a. *-ėrn-mōst*, farthest toward the south. SOUTHING, a. *sowth'ĭng*, going toward the south: N. tendency to the south; the distance a ship makes good in a south direction. SOUTHMOST, a. *sowth'mōst*, farthest toward the south. SOUTH'NESS, n. *-nĕs*, the tendency in the south end of a magnetic needle to point toward the south pole. SOUTH'WARD, ad. colloquially *sŭth'ėrd*, toward the south: N. the southern regions. SOUTH'WARDLY, ad. *-lĭ*. SOUTHWEST, n. *sowth'wĕst*, the point equally distant from the south or west, or the point between them: ADJ. coming from the southwest. SOUTHWEST'ERLY, a. *-ėr-lĭ*, in the direction of southwest, or nearly so; coming from the southwest. SOUTHWEST'ER, n. *-ėr*, among *seamen*, a storm or gale from the southwest; a painted-canvas hat with round top and a broad flap for falling over the neck, for use at sea in stormy weather, also worn by coal-heavers —usually pronounced *sow-wĕst'ėr*. SOUTHWEST'ERN, a. *-ėrn*, in the direction of southwest. SOUTH FRIGID ZONE, the zone of the earth contained between the south pole and the Antarctic circle. SOUTH TEMPERATE ZONE, the zone of the earth contained between the tropic of Capricorn and the Antarctic circle. SOUTHERN CROSS, a constellation of the southern hemisphere, having the appearance of the figure of a cross. SOUTHERN HEMISPHERE, one of the two hemispheres of the earth, lying to the south of the equator. SOUTHERNWOOD, n. *sŭth'ėrn-wŭd*, a common aromatic plant, allied to the wormwood (see ARTEMISIA).

SOUTH, *sowth*, ROBERT, D.D.: brilliant writer and zealous Anglican priest: 1633-1716, July 8; b. Hackney; son of a London merchant. His earlier education was at Westminster School, of which Dr. Busby was master; and 1651 he became a student at Christ-Church, Oxford. In 1654 and 57 successively, he took his degrees as bachelor and master of arts; and was ordained 1658. In 1654, at Oxford, he had congratulated Cromwell in Latin verses; in 1657, before his ordination, he had preached as a strong Calvanist and Presbyterian. In his new function of university orator, to which he was appointed 1660, he was fortunate enough to please Lord Chancellor Clarendon on his installation as chancellor of Oxford, and, in reward of his complimentary periods, South was made his domestic chaplain. In 1663 he took his degree D.D.; the same year he was promoted to a prebendary stall at Westminster; and 1670, he became a canon of Christ-Church, Oxford. Afterward he became rector of Islip, in Oxfordshire, and was chaplain-in-ordinary to Charles II. It is said by some writers that he steadily declined to be a bishop; others assert that his naturally sarcastic and pugnacious temper probably precluded such an appointment, which his abilities would otherwise have procured. The designs of James II., tend-

ing to a Roman Catholic revival, he regarded with deep disapproval and alarm; but so strong was his sense of the duty of submission to the reigning monarch, that he declined all share in the conspiracy to oust him in favor of the Prince and Princess of Orange. When, however, the revolution was accomplished, he gave in his adhesion to it. But, to his honor, he refused to profit in the way of preferment, by the deprivation of such of the higher dignitaries of the church as could not conscientiously go with him in recognition of the new order of things. A bigoted adherent of the Church of England, he waged unsparing war from the pulpit, and with his pen, against Puritanism and every other form of dissent, vigorously opposing the act tolerating non-conformists. Occasionally he occupied himself with discussions more strictly theological. He is now remembered chiefly by his sermons—masterpieces of vigorous sense and sound English, abounding in lively and witty turns, not always in severely decorous consonance with the seriousness of the subject. His style is brilliant and exuberant; his wit is not genial, but sarcastic. As a man, South seems to have been of estimable character; of pure life and unblemished integrity, and notable for his charities. His entire works were sent from the Clarendon press in 7 vols. (1823), 5 vols. (1843). An edition in 2 vols. appeared London 1850.

SOUTH AFRICAN REPUBLIC (now the TRANSVAAL COLONY); n. of the Vaal river, s. of the Limpopo; till 1877 independent; 1877-81 a Brit. territory; annexed by Great Britain 1900. It formerly included the region n. of the Vaal river (whence its name) on both sides of the Magaliesberg or Cashan Mts., into which the emigrant Boers (see BOER) retired after annexation of the Orange Free State to the British crown 1848. The boundaries of South African Republic, as defined by convention of London 1884, are: w. Bechuanaland; e. Portuguese territory; s. Swaziland, Zululand, Natal and Orange Free State; 119,139 sq.m.: cap., Pretoria. In 1903, about 7,000 sq.m. were attached to Natal. This whole region is in general a vast plateau, sloping to the n., supported by the coast-line of mountains, which, presenting a bold mural buttress or escarpment to the low country at their feet, stretch away on their w. flank into vast undulating plains. At right angles to the coast-range, another belt of very high lands, the Magaliesberg, runs e. and w., forming a water-shed between the river-system of the Vaal or Orange and Limpopo rivers. The s. face of this range also presents long and undulating plains, generally well watered and wooded, and abounding with large game.

The average height of the plateau inhabited by the emigrant farmers of European descent is from 4,000 to 5,000 ft. Many of the peaks of the mountain range traversing the plateau attain an elevation of 9,000 or

SOUTH AFRICA.
SCALE OF STATUTE MILES.
0 100 200 300
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30° Longitude East from Greenwich.
SOUTH INDIAN OCEAN
CAPE OF GOOD HOPE
CAPE COLONY
BRITISH BECHUANA LAND
ORANGE RIV. COLONY
NATAL
TRANSVAAL COLONY
SOUTH AFRICA REPUBLIC
BRITISH SOUTH AFRICA COMPANY
GREAT NAMAQUA LAND
DAMARA LAND
KALAHARI DESERT
OVAMBO LAND
BARUTSE KINGDOM
MAROTSE LAND
MARUNDA
ZAMBESIA
CENTRAL AFRICA
MOZAMBIQUE
MOZAMBIQUE CHANNEL
MADAGASCAR
ANTANANARIVO
Cape Town
Cape of Good Hope
Port Elizabeth
Durban
Pietermaritzburg
Bloemfontein
Pretoria
Johannesburg
Kimberley
Salisbury
Beira
Quilimane
Lourenço Marques
Zambesi
Mouths of the Zambesi
Cape Colony
Orange River
Gariep or Orange River
Walfisch Bay
Sandwich Harbor
Angra Pequena or Luderitz Bay
Angras Juntas Bay
Spencer Bay
Hondeklip Bay
Olifant River
Cape St. Martin
False Bay
Cape Agulhas
Cape St. Francis
Great Fish River
Tugela River
Umzimvubu (St. Johns R.)
Sta. Lucia Lake
Delagoa Bay
Inhambane Bay
Inhapallata River
Cape Colatto
Cape Corrientes
Cape Lady Grey
Cape Mashanca (Sta. Maria)
Cape Delgado
Mozambique
Lurio Bay
Passandava Bay
Port Radama
Majamba Bay
Bembatooka Bay
Tamatave
Andovoranto
Mahavelona
Mahanoro
Tulear
Point Barrow
Cape St. Mary
Afu Vato
Andrahombe
Manambato
Ft. Dauphin
Mananara
Tintingue Harbor
Antongil Bay
Ambohipeno
Mahamaniria
Ambahy
Masindrano
Ambositra
Anamboarina
Tsimandrafouzane
Tambohorano
R. Douko
Mafaidrano
Marofototra Pt.
Nossi Andriambala
Europa I.
Fisherenamasay
Halara
Kihariro Desert
St. Augustine Bay
Tropic of Capricorn
Comoro Islands (Fr.)
Gt. Comoro I.
Mayotta I.
Nossi Be I.
Gloriosa Is. (Br.)
Farquhar Is. (Br.)
St. Lazarus
Bank Mohilla I.
Johanna I.
Mt. Amber
Vohemar
Antalaha
Ft. Alaotra
Ft. Mahavelona
Ft. Dauphin
Ft. Humbe
Mpashi
Omondonga
Okondjuo
Otyzondyopat
Okozondyer
Otjimbingue
Swakopmund
Salem
Rehoboth
Hoachanas
Gibeon
Keetmannshoop
Beersheba
Bethany
Nisbet Bath
Port Nolloth
Springbok
Rondable
Carnarvon
Victoria W.
Fraserburg
Calvinia
Clanwilliam
Piquetberg
Malmesbury
Stellenbosch
Cape Town
Robertson
Swellendam
Riversdale
Bredasdorp
Breede River
Alexandria
Port Elizabeth
Cradock
Queenstown
Kingwilliams Town
Aliwal South
Georgetown
Melville
Cape St. Francis
Bulawayo
Salt Pans
Tati
Lahompo
Makabele
Biles Pool
Shoshong
Mafeking
Vryburg
Kuruman
Gobabis
Twass
Otjimbinde
Windhoek
Molopolole
Kanye
Zeerust
Rustenburg
Lichtenburg
Pietersburg
Maraba
Nylstroom
Lydenburg
Middelburg
Ermelo
Bloemhof
Bethlehem
Harrismith
Ladysmith
Newcastle
Dundee
Kokstad
Umtata
Alexandra
Port Natal
Tete
Boma
Matiamba
Sitanda
Mokumbi
Chitambo
Kazembo
Kasamba
Mere Here
Nana Kaudunu
Kazembe
Mussumba
Kisoge Lake
Moero Lake
Tanganyika
Nyassa
Zambesi
Shire R.
Lake Shirwa
Mt. Hampden
Mt. Ankarat
Mt. Ankaratra
Mt. Lebombo
Mt. Kenya
Mt. Kilimanjaro
Mt. Elgon
Mt. Ruwenzori
Mt. Mlanje
Mt. Gorongosa
Mt. Chimanimani
Mt. Sinoia
Mt. Hanyani
Mt. Kaffa
Mt. Longa
Mt. Gongo
Mt. Miango
Mt. Malomo
Mt. Kathiba
Mt. Kaffa

10,000 ft., and are covered with snow some months in the year. The altitude of the coast-line of mountains is estimated at 6,000 to 7,000 ft. above the low region at their feet.

According to a treaty between Portugal and the Transvaal republic, the latter enjoyed free transit of all goods through the Portuguese harbors on the e. coast; and in order to save the import dues levied by the colony of Natal, diligent efforts were made to secure direct access, by road and rail, to Delagoa Bay. As this line passed through the dominions of an independent chief, the Boers were soon embroiled in desultory war with the latter. Their policy further provoked so intense excitement among the natives on the Kaffrarian frontier of the Cape Colony, and so seriously menaced the well-being of the British settlements, that Britain interfered, and ultimately, 1877, Apr. 12, annexed the territory of the republic. A rising of the Boers took place in the end of 1880. The British garrisons in the Transvaal were besieged, and a force of Boers crossed into Natal to meet the available British forces advancing against them. The Boers took up a strong position at Laing's Nek, within the Natal frontier, from which the English forces failed to dislodge them; and in several engagements the Boers more than held their own. Peace was negotiated while large English reinforcements were on their way to South Africa. It was agreed that the Transvaal should acknowledge the suzerainty of the British sovereign; and, while complete self-government was granted to the Boers, the control of foreign relations (i.e., specially with the native tribes) was reserved.

In 1884 the independence of the republic was fully recognized in the convention of London, by which conflicting claims as to its territorial limits were settled. In 1890 a special commissioner to Great Britain submitted a proposition that the South African Republic would withdraw from the n. and w. of Swaziland if Great Britain would withdraw from the e., and that the South African Republic would enter into a customs union as soon as it got a suitable port.

The region is rich in wheat-land and might become the granary of the interior. The discovery of gold in the early eighties brought an influx of foreigners, largely British, and heavy investments of British capital. The city of Johannesburg in the centre of the Witwatersrand gold-fields was rapidly built up until it contained (1890) a pop. of 60,000, mostly foreigners, termed by the Boers Uitlanders. By the constitution of the South African Republic these settlers were precluded from voting or holding office. Meanwhile they complained that they were excessively taxed and that none but Dutch schools were provided for their children. With these causes of complaint was joined the British ambition to secure a continuous strip of British territory from Cairo to Cape

Town through the heart of Africa, while the British South Africa Co. was eager to get full control of the Transvaal gold-fields, of which that company is said to have been in desperate financial need. Late in 1895, in Johannesburg, a provisional 'Transvaal National Union' was formed and a 'reform committee' appointed. Plans were laid for an uprising in Johannesburg in the interest of the British residents, and prominent citizens wrote to Dr. L. S. Jameson, administrator of Mashonaland, for aid. On the night of Dec. 29, 1895, Dr. Jameson, with 700 armed men crossed the frontier. In the meantime, President Krüger had pacified the people of Johannesburg by timely concessions, and the threatened uprising there was averted. Dr. Jameson with his whole force was defeated and captured by the Boer militia. These events produced great excitement in England. Dr. Jameson's action was officially disavowed. Cecil J. Rhodes, premier of Cape Colony, who was believed to have sanctioned the movement against the Boers, resigned 1896, Jan. 10, and was succeeded by Sir J. Gordon Sprigg. President Krüger surrendered his prisoners to the British authorities for trial by British law. The German emperor sent (1896, Jan. 3) a congratulatory telegram to President Krüger which aroused great indignation in England as an infringement of the suzerainty which the British claim over the Transvaal; he sent also a promise of military aid to the South African Republic. In 1896, Jan., over 50 members of the 'reform committee' were arrested in Johannesburg, including Col. Francis Rhodes, whose brother, Cecil J. Rhodes, was director of the British South Africa Co., and premier of Cape Colony; including also a prominent American, John Hays Hammond. These with three other leaders were sentenced to death, but their sentences were afterward commuted to heavy fines. After the trial President Krüger made public a series of captured telegrams, conclusively proving that Dr. Jameson's raid had long been projected and with the complicity of high officials of the British South Africa Co. In June Cecil Rhodes resigned as director of the company. June 28 Dr. Jameson and a number of his officers were sentenced in England to various terms of imprisonment. July 30 the British parliament appointed a committee of inquiry, which held protracted sessions, summoning among others ex-Premier Rhodes before them; but so evident was the purpose to exclude important evidence as to leave in the public mind the conviction that persons high in authority in England were concerned in the movement. In 1899 the South African Republic and the Orange Free State invaded British territory, beginning a war which was virtually closed by the capture of Pretoria and the annexation of the colony 1900, Sept. 1, though hostilities continued till June 1902.

SOUTH AFRICAN WAR: a conflict (1899-1902) be-

tween Great Britain one one side and the South African Republic (Transvaal) and the Orange Free State on the other. The South African Republic felt that it had a grievance against Great Britain, and that unless the absolute independence of the country was allowed, it was only a question of time when British influence would be paramount in internal affairs, as it was in external. Moreover, the majority of the people felt that Great Britain had been defeated in the conflict of 1884. 'Majuba day,' when a British force had been defeated, was annually celebrated as commemorating a great event in their history, and this tended to keep alive a spirit of hostility to Great Britain, and perhaps to foster thoughts of a greater triumph that might be attained in the future. The wars with the natives, continued even after 1884, had made the Boers on the whole a military people, and about 1893 President Krüger began to increase the Transvaal armaments, seeing that nothing but force could ultimately keep the Uitlanders—the non-Boer settlers in the Transvaal, especially in Johannesburg—from gaining political rights, and that force would also be necessary to enable him to get rid entirely of British supremacy, and to secure, what he had long desired, free access to the coast. The Jameson Raid furnished ground for increasing the warlike equipments of the country, all of the newest and best. The oppressed Uitlanders were heavily taxed to pay for these munitions of war, were allowed no share in the government, and were treated in a harsh and domineering spirit. Early in 1899 a numerously signed petition from British residents in the Transvaal was forwarded by Sir Alfred Milner, the high commissioner, to the home government, setting forth the grievances of the petitioners, and declaring their position to have become 'intolerable.' There followed a long series of conferences between President Krüger and President Steyn, of the Orange Free State, on one side and the foreigners on the other, but nothing came of them, and the South African Republic presented an ultimatum, delivered to the British agent in the Transvaal on Oct. 9, 1899, for answer within 48 hours, demanding that all matters in dispute be settled by arbitration or in some other way to be agreed on; that all troops on the borders of the republic should be instantly withdrawn; that reinforcements which had arrived in South Africa since June 1 should be removed from South Africa within a reasonable time; and that the troops then on their way to South Africa should not be landed. War at once followed, the Orange Free State, by a previous arrangement, joining the neighboring republic.

The war was actually begun by the Boers invading Natal and Cape Colony, Ladysmith in the former and Kimberley and Mafeking in the latter, being the places in which the greatest interest was almost immediately centered. At the beginning of the struggle the British

regular troops in South Africa did not greatly exceed 20,000 in number, about half of them being in Natal under the command of Sir George White, who had his headquarters at Ladysmith.

The earlier conflicts resulted almost uniformly in the defeat of the British and the home government made the most strenuous efforts to get sufficient troops into Africa, to overcome the resistance of the Boers by overwhelming numbers. It was determined to send out the 7th army division already mobilized, to call up the remainder of the army reserve, to incorporate a new yeomanry force, to allow 12 battalions of militia to volunteer for service abroad, to employ volunteers on active service, and to accept offers of help made by the great colonies. Lord Roberts was instructed to proceed to South Africa as commander-in-chief, with Lord Kitchener as chief of his staff; and Col. Hector Macdonald was appointed to succeed Gen. Wauchope in command of the Highland brigade.

When the year 1900 opened, the troops hemmed in at Ladysmith, Kimberley, and Mafeking were holding their own, but at first place enteric fever had begun to make serious ravages, and to cause much anxiety. In the Cape Colony, Methuen was confronted by Gen. Cronje in a strongly intrenched position; and Gatacre, after falling back from Stormberg, was holding Sterkstroom. French in the Colesberg district was more actively employed, and succeeded in defeating the Boers in several important actions. Lord Roberts and his staff arrived at Cape Town on Jan. 10, but before anything could be done by the new commander-in-chief, Buller made another attempt against the Boer position at Colenso (Jan. 11). With this unsuccessful movement is associated the name of Spion Kop, an eminence in the scene of action, the seizure and temporary occupation of which cost many British lives to no purpose. Yet a third attempt was made to break through to Ladysmith (Feb. 5), Vaal Krantz being a position which figured most prominently on this occasion; but again the result was only disappointment, to the besieged force more especially. Meanwhile Roberts had been making plans for more effectively dealing with the enemy, and had got together a strong cavalry force under French between the Orange river and the Modder. While the attention of the Boers under Cronje was drawn off by a movement carried out by Macdonald and the Highland Brigade, French advanced rapidly on Kimberley and, in spite of all opposition, reached the place, dispersed the investing troops, and entered the town (Feb. 16). Cronje at Magersfontein had now allowed himself to get into a difficult position, not fully realizing the strength and intentions of the British, and though he tried to escape eastward toward Bloemfontein, it was too late. He was brought to a halt at Paardeberg, took refuge in the bed of the Modder, where he managed to

hold out for a week, but being completely hemmed in, and an attempt at his rescue by Gen. De Wet being defeated, he surrendered to Roberts with over 4,000 men. This was on Feb. 27, the anniversary of Majuba Hill. Cronje and the rest of the prisoners were sent to Saint Helena. Meanwhile fresh efforts were being made by Buller for the relief of Ladysmith, and this time with success. After a series of difficult operations, the Boer left was finally turned, and on Feb. 28 Lord Dundonald rode into Ladysmith. The garrison was found to be in sore straits for want of food, and had suffered severely from disease as well as from the attacks by which they had been harassed. One of the fiercest of these had been made on Jan. 6, when the Boers had endeavored to take the town by storm, but were repulsed with heavy loss. On this occasion a position known as Wagon Hill had been three times captured and recaptured in the course of the day, Col. Ian Hamilton here greatly distinguishing himself. It has been said that 'the successful defense of Ladysmith was from a military point of view the most valuable achievement of the war, inasmuch as the loss of a garrison of 12,000 men would have been a graver disaster than any conceivable defeat in the open field; and, moreover, the fall of Ladysmith was to be the signal for the general rising of the Dutch in the Cape Colony and Natal.' Following on the successes in the west of the Orange Free State came successful operations by the generals in the northern parts of Cape Colony—Gatacre, Clements, and Brabant. Bloemfontein now became Roberts' objective, and after Joubert had vainly attempted to bar his way at Poplar Grove, and again at Driefontein, the British commander entered the capital of the Orange Free State practically without opposition (March 13). Krüger and Steyn fled to the north. The keys of the town were surrendered to Lord Roberts, and the railways being soon repaired, through communication was opened between Bloemfontein and Cape Town. The Orange Free State was proclaimed British territory.

But the war was far from ended; De Wet and Louis Botha, the Boer commanders, proved themselves able strategists; and although often seemingly at the point of being captured, always managed to escape, while the British lost heavily through disease and casualties. In Sep. 1900, Roberts declared the South African Republic to be annexed to the British dominions.

On Sep. 11, President Krüger took refuge in Portuguese territory, and many of his compatriots followed his example, or scattered in different directions, having previously destroyed many of their guns, with vast quantities of ammunition and stores. Lord Roberts reported that there was nothing left of the Boer armies but a few marauding bands, but this view of the case proved premature. On Oct. 6, Buller left the army for England; on the 20th President Krüger sailed for Europe on

board a Dutch man-of-war. Lord Roberts left for home before the end of the year, handing over the chief command to Lord Kitchener.

The conflict was now reduced to a guerilla warfare. Marauding bands even entered the territory of Cape Colony, and for a time gave much trouble, aided and encouraged as they were by their Dutch friends. To checkmate the Boer system of warfare Kitchener resolved to clear the country of food and cattle so as to deprive the Boers of supplies, to protect the railways by chains of blockhouses, to carry similar chains across the country in suitable directions, and to keep the Boers perpetually on the move by mobile columns of British troops. Kitchener's measures, which were found exceedingly effective in the long run, included the gathering together of great multitudes of Boer women and children into the so-called concentration camps, a measure widely discussed and much condemned in the press of neutral countries.

A discussion regarding terms of peace took place between Lord Kitchener and Gen. Botha on March 28, 1901, but nothing came of it; the gradual wearing down of the Boers went on, and by the end of May they had lost practically all their artillery (apart from guns buried in the earth). On July 12 the Free State government and some important papers were captured at Reitz, and President Steyn himself made a narrow escape. On Aug. 7, Kitchener issued a proclamation calling for the surrender of the Boers by Sep. 15, on pain of the perpetual banishment of the leaders, and of the property of the others being charged with the cost of maintenance of their families in British lands. The Transvaal and Free State leaders had been discussing the advisability of giving in, but President Krüger, from Europe, urged them to continue fighting till their independence was secured. Renewed activity on the part of Botha, De Wet, and other Boer leaders followed, and the British met with one or two rather serious mishaps. By the end of the year 1901 there had been put out of action some 53,000 Boers, of whom over 40,000 were in concentration camps, or were kept in custody in St. Helena, Ceylon, India, Bermuda, or elsewhere. After some great 'drives' organized by Kitchener and carried out in the early part of 1902, which resulted in the surrender of many burghers, and which owed their success largely to the blockhouse system, negotiations for peace were at last entered on March 23, though military operations were not suspended. The Boer leaders were granted facilities for meeting and discussing matters among themselves and with the different commandoes, and after this had gone on for some time, on May 15 a conference of Boer representatives met at Vereeniging to consider terms of surrender. It was not till the last day of the month, however, that peace was absolutely secured, the surrender being signed at Pretoria by Lords

Kitchener and Milner and the chief civil and military representatives of the Boers, and the war thus brought to an end. The main points agreed upon were: that the Boer forces would immediately lay down their arms and hand over all guns, rifles, and munitions of war; that burghers in the field outside the Transvaal and Orange River Colony, and all prisoners of war outside South Africa, on declaring their acceptance of the position of subjects of Edward VII., should be brought back to their homes as soon as transport could be provided and their means of subsistence secured; that no proceedings civil or criminal should be taken against burghers so surrendering or returning, for acts done in connection with the war, unless as regards acts contrary to the usages of war; the Dutch language to be taught in public schools where parents desire it, and to be allowed in courts of law; the possession of rifles to be allowed to persons requiring them for protection, on taking out a license; military administration to be succeeded as soon as possible by civil administration, and ultimately representative institutions and self-government; a sum equal to $15,000,000 to be granted for the purpose of assisting in the restoration of the people to their homes, besides advances on loan free of interest for two years.

In this struggle there had been engaged on the British side at one time or another, or sent to the seat of war as reinforcements, from the outbreak of war until the conclusion of peace, 448,435 men of all arms, including 228,171 regulars, 45,566 militia, 35,520 yeomanry, 19,856 volunteers, 7,273 South African constabulary, 18,229 regular troops from India, 29,000 colonial contingents, 52,414 raised in South Africa. Of these 518 officers and 5,255 men were killed, 1,851 officers and 20,978 men were wounded, 554 officers and 15,617 men died of wounds or disease. How many men the Boers had in the field from first to last, including the rebels belonging to Cape Colony and Natal, will probably never be known. The number has been estimated by competent authorities at 60,000 to 65,000. The Boer casualties have never been definitely ascertained. Consult: Davis, *With Armies in South Africa;* Barnes, *The Great War Trek;* Doyle, *The Great Boer War;* Cunliffe, *History of the Boer War;* Amery, *The Times History of the War in South Africa.*

SOUTH AMBOY: borough in Middlesex co., N. J.; at the mouth of Raritan river and the head of Raritan bay, and on the Pennsylvania, the Central of New Jersey, and the Raritan River railroads; 20 m. s. of Newark. It was founded in 1835, and became a borough in 1888. It is important as a shipping point for coal, and has terra-cotta works, clay and sand pits, and asphalt works; there is a national bank with a capital of $50,000. The most notable public building is the borough hall; and there are two public schools and a Roman

Catholic parish school. The government is vested in a mayor, and a council of six; two members of which are elected each year for a term of three years. Pop. (1890) 4,330; (1900) 6,349; (1910) 7,007.

SOUTH AMERICA: a continent, joined to Central America at about lat. 8° n., lon. 77° 15′ w. by the Isthmus of Darien, the boundary line between Colombia and the new republic of Panama being taken as approximately the limit of South America on the n.w. That line is nearly due s. of Washington, D. C. The westernmost point on the South American coast is directly s. of the peninsula of Florida; both the extreme northerly point, projecting into the Caribbean Sea, and, at the extreme s., the archipelago of Tierra del Fuego, adjoin 70° w., the longitude of Cape Cod, Mass. Thus we see that the Pacific coast and half of the Caribbean coast of South America lie exactly s. of the Atlantic coast of the United States. But a relatively small part of the great equatorial mass between lat. 10° n. and lat. 25° s. is west of 70°. Pernambuco, Brazil, is situated so much farther toward the e. (the width of the continent there being about 3,000 m.) that the sailing distance from that important port to the coast cities of Spain and Portugal is less than to New York. For all purposes of social intercourse, trade, and communication in general, the eastern and western coasts below the equator are much more easily reached from Europe than from the great centres of population in the United States. Some of the sailing distances are given as follows: Pará to Lisbon, 3,248 m.; Pernambuco to New York, 3,696 m.; Pernambuco to Plymouth, England, 3,867 m.; and in a later paragraph it will be shown that the superior facilities for transportation and direct intercommunication between Europe and these ports below the equator have hitherto accentuated this slight advantage, or, let us say, converted into marked advantage a virtual equality in geographical situation.

The natural avenues of internal transportation and communication are the great rivers which pierce the continent from the e., n.e., and s.e.—avenues still waiting to be improved and fully utilized. The accompanying sketch-map shows the main river-systems: that of the Amazon (including the Madeira, Negro, etc.), draining the central regions and the farthest west, even the Pacific coast range in Peru, and the cordillera of the Andes in Colombia and Bolivia; that of the La Plata (Paraná, Paraguay, and Uruguay rivers), also draining the centre and west, though reaching far toward the east for two of its chief sources of supply, and pouring its enormous stream into the Atlantic beyond Buenos Ayres and Montevideo; that of the Orinoco, uniting in itself many rivers of the northwest and north, and entering the ocean near the boundary of British Guiana and Venezuela; that of the Tocatins (Tocatins and Araguay rivers),

SOUTH AMERICA
SCALE OF MILES
0 100 200 300 400 500 600
Longitude West from Greenwich
EQUATOR
TROPIC OF CAPRICORN
VENEZUELA
COLOMBIA
ECUADOR
PERU
BOLIVIA
BRAZIL
PARAGUAY
URUGUAY
ARGENTINA
CHILE
BRITISH GUIANA
DUTCH GUIANA
FRENCH GUIANA
FALKLAND ISLANDS
SOUTH GEORGIA
JUAN FERNANDEZ ISLANDS
GALAPAGOS ISLANDS
CHONOS ARCHIPELAGO
TIERRA DEL FUEGO
Caracas
Bogota
Quito
Lima
Sucre
La Paz
Asuncion
Montevideo
Buenos Aires
Santiago
Valparaiso
Rio de Janeiro
Mouth of the Amazon
Cape Horn
Mt. Darwin
Magellan Strait
VALPARAISO
SCALE
0 1 2 Miles
SANTIAGO and Vicinity
SCALE
0 1 2 Miles
BUENOS AIRES
SCALE
0 1 2 Miles
RIO DE JANIERO
SCALE
0 1 2 Miles

merged in the Pará estuary below the Gulf of the Amazon; that of the São Francisco, rising in the mountains n. of Rio de Janeiro and reaching the ocean between Bahia and Pernambuco; that of the Magdalena and Cauca in Colombia, etc. The heavy lines on the small map just referred to have been drawn with the design of conveying at a glance an impression which should be in agreement with the records of four centuries of exploration—the impression, namely, that in the vast central regions, where the inhabitants number less than one to the sq.m. (as the map also indicates), the courses of great rivers lie side by side, approaching each other so nearly, certainly in some, and probably in many localities, that they furnish almost continuous waterways between the n.w. and the s.e. the lower departments of Colombia and Buenos Ayres. Between the Atlantic and Pacific, through the broad part of the continent, continuous water routes, e. and w., n.e. and s.w., extend to the foot of the Andes, and in one noteworthy instance beyond all except the oldest ridge in the Andean cordillera.

In the country n. of the Amazon, a navigable route between the Orinoco and the Amazon's widest northern tributary, Rio Negro, already exists as a natural canal or connecting stream, the so-called Cassiquiare river; but unfortunately rapids obstruct navigation on both the Orinoco and Rio Negro between the Cassiquiare and the ocean. The Amazon's greatest tributary, the Madeira river (itself as opulent in water as the Mississippi) is navigable by large steamers from its mouth to 8° 45′ s. Between the latter point and 11° s. there is a series of cascades, extending to the confluence of the Mamoré and Beni rivers, and on the former still 50 m. farther toward the s. Were it not for these cascades, the Mamoré, Beni, and Madre de Dios rivers (forming the tripod shown on the small map) would furnish a most convenient outlet for the products of the Bolivian Sierra and southeastern Peru. It is understood that Brazil has agreed to maintain a railway, running from a point on the Madeira below the obstructions to lat. 11° s. on the Mamoré, thus enabling Bolivia to make use of the northeasterly waterway to the Atlantic Ocean. Explorations of the Pilcomayo and Bermejo rivers, which also rise in the Bolivian highlands, but unite with the Paraguay, have not as yet given definite results. On the other hand, practicable routes have been discovered, for steamboats of moderate size, between the interior of Colombia and the Amazon.

For estimates of the areas of the South American countries; also for their mineral resources, agriculture, manufactures, weights, measures, and money, banks, governments (including the judiciary and the local governments), finances (revenues, expenditures, and public debts), armies and navies, population, educational systems, religion, etc., see the special articles devoted to

each of the South American republics and Guiana, Education in Latin-America, and Spanish-American Literature. For climate, fauna, and further comments upon physical geography and hydrography, see the same special articles and the general article AMERICA,

Political Divisions.—South American republics are: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, and Venezuela. Geologically, Panama belongs rather to the Central American (Antillean) continent. Dependencies of European countries on the South American mainland are the three Guianas—British, Dutch, and French.

Geology.—Charles Darwin writes, in his *Journal and Remarks*, under date of March 21, 1835, that the Andean cordillera in Chile 'consists of two principal ranges, the passes across which attain respectively an elevation of 13,210 and 14,365 ft. The first great line . . . is called Peuquenes . . . To the eastward, a mountainous and elevated region separates it from the second range (called the Portillo) overlooking the Pampas. The streams from the intermediate tract find a passage . . . through this *second* line.' Mr. Darwin then gives 'a very brief sketch of the geological structure of these mountains,' and reaches the conclusion 'that the Peuquenes existed as dry land for a long period anterior to the formation of the second range.' He adds, 'I will only make one other geological observation: the Portillo chain in the neighborhood of the pass is rather more elevated than the Peuquenes, yet the waters of the intermediate district have burst a passage through it. On the supposition of a subsequent and gradual elevation of the second line, this can be understood; for a chain of islets would at first appear, and as these were lifted up, the tides would always be working out deeper and broader channels between them.' He also refers to 'an hydrographical phenomenon of a nearly similar kind, but on an infinitely grander scale, which occurs in Bolivia'—namely, the escape of rivers through such an immense mountain-pass as the Bolivian Cordillera—and observes that 'excepting through the explanation above offered, the circumstance that rivers flowing from a less elevated chain should penetrate one far more lofty, appears to me quite inexplicable.' It seems probable—indeed, quite certain—that Mr. Darwin would have been willing to extend the same process of reasoning to the 'hydrographical phenomenon' presented by the Marañon river, which flows northward about 350 m. in Peru between the maritime and central Cordilleras, confined both by the latter and the enormous eastern chain, or Andes proper, but finally escapes in an equally impressive fashion and straightway begins its long easterly course to the Atlantic. We must hold, then, that in Peru the maritime Cordillera is much older than the central and eastern chains; that while the latter were being

gradually lifted up the easterly trend of the Marañon was already marked out; and the conclusion is inevitable that the parent stream of the Amazon is the Marañon, for clearly this distinction cannot be accorded, as so many travelers and geographers have sought to prove that it should be, to the Ucayali or some other river, formed on the more recent eastern Andean slopes and sooner or later uniting with a current which must have existed 'for a long period.' Another deduction from Mr. Darwin's 'geological observation' is this: The Andes Mountains, 'wringing from the vapor-laden trade-wind,' as has been well said, the last particle of moisture that their snow-peaks can extract—and by this means creating so many large rivers—are not to be regarded as at all points an insurmountable double or triple barrier between the Pacific ports and the interior. On the contrary, the more recently formed heights, overlooking the Montaña, still show, here and there, 'deep and broad channels (valleys) between them.' See also CORDILLERA.

Commerce.—The causes which have been pointed out in the opening paragraph—the facts (1) that South America is in reality, from the point of view of inhabitants of the United States, southeastern America, and (2) that the eastern and western coasts below the equator are, for the reasons given, much more easily reached from Europe than from the great centres of population in the United States—produce effects which should have been foreseen: a large part of the southeastern continent receives its ideas, manners, fashions, and culture from Europe, and, of course, bestows its trade in the same quarter. The commerce of all the republics and European dependencies in that part of the world has been most thoroughly analyzed and fully stated in publications of the Treasury Department and Department of Commerce and Labor, of the government of the United States, and in the bulletins and handbooks of the International Bureau of the American Republics; to all of which the reader is referred for a more detailed account.

As has been said, the natural channels of communication are the great rivers. More, when supplemented by railroads over the mountains, will open up an immense territory, still virgin at the end of the first decade of the 20th century. One line of railroad, the work of American engineers, crosses from Valparaiso to the Atlantic coast, and the rich mineral regions are being opened up by shorter lines to the Pacific coast. At best, railroads can be little more than feeders to the river commerce, for it will be many years before the returns in capital invested will warrant large outlay, because the rivers need but little improvement to supply the cheapest possible highways for traffic. The extent of the territory that these rivers irrigate is more than 4,000,000 sq.m. in the Amazon and Orinoco systems, and

he extent of their navigable waters, is as follows: In Brazilian Guiana, the Trombetas, for steamers, 200 m.; in Venezuela and adjoining territory, the Orinoco, with its affluents (the Meta, Arauca, and Vichada), and the Rio Negro and Cassiquiare, combined, more than 1,000 m.; in Colombia, the Putumayo (with free navigation for steamers during the whole year), 1,200 m., and the Caqueta or Yapura, rising in Lake El Buey, which is also the source of the Magdalena system, and flowing 1,600 m., of which 1,300 are navigable for steamers; in Ecuador, the Napo, rising e. of Quito, navigable for steamers 800 m., the Patasa and the Tigre, navigable for steamers respectively 500 and 300 m.; in Peru and adjacent territory, the Morona (200 m., river steamers), Guayaga or Huallaga (300 m., river steamers), Ucayali (600 m., river steamers), Yurua (700 m., river steamers), Yavari (900 m., river steamers), and the Marañon or Amazon, which has a course of more than 4,100 m., navigable by trans-atlantic steamers 3,000 m. (there being two direct lines of steamers running from Liverpool to Iquitos, in eastern Peru), and by river steamers 3,400 m.; in Bolivia and adjacent Brazilian territory, the Purus, navigable for steamers 1,500 m., and the Beni and Madre de Dios, 'which can easily be connected with the [navigable portion of the] Madeira,' the latter being navigable for steamers 1,000 m.; in Brazil (besides the lower course of the largest rivers and the main body of the Amazon), the Xingu, navigable for steamers 600 m., and the Tocatins, navigable for steamers 500 m. The last mentioned river passes 'at the port of Sierra Esclavana' only a few m. from the river Alto de la Plata or Paraná, 'with which it could be connected by means of a railway or of a canal, and thus the navigation in the currents of the river de la Plata could be united with the immense volume of water of the Amazon.' The total extent of the navigable waters of the foregoing rivers is given as 16,000 m.

Ethnology.—In the articles devoted to each of the Latin-American countries, some intimations are conveyed of the essential differences between the several communities in respect to the component elements of population. Each South American country must be studied as a separate problem. Professor Latané, in his *Diplomatic Relations of the United States and Spanish America*, writes: 'It should be borne in mind that in Spanish America the native Indian races were not driven beyond the frontier of civilization, as they were by the English settlers, but became and remain to this day an integral part of the population. There was thus in the Spanish colonies an unusual admixture of races. There were (1) European Spaniards; (2) Creoles, or children born in America of Spanish parents; (3) Indians, the indigenous race; (4) negroes, of African race; (5) Mestizos, children of whites and Indians; (6) mulattoes, children of

whites and negroes; and (7) Zambos, children of Indians and negroes.' This may be taken as a convenient generalization to serve as a starting point; and it is evident that the next steps beyond it should lead us to examine (1) the distinguishing and by no means identical characteristics of the Spanish and Portuguese ruling classes—the latter mainly in Brazil; (2) the varying proportions in which the white, Indian, and negro components are found; (3) the exceedingly important matter of immigration from Europe and the Orient; and (4) the physical and moral characteristics of the Indian element, since we must sometime awaken to the fact that members of different native races are quite as unjustly treated, when they are forced against nature into a single class or category, as citizens of different European countries would be if sweeping generalizations were in the same reckless way applied to them. A valuable suggestion in regard to the disappearance of great numbers of the inferior, constitutionally feeble Brazilian indigines (and this reasoning may partially explain the fate of some other South American and West Indian tribes as well) is offered by Dr. J. Hampden Porter, who writes: 'Despondency, to which these natives yield without a struggle, acts as it never could do among men who had any mental or physical stamina. . . . Despondency or despair has played so conspicuous a part in this country [Brazil] as the cause of death among natives subjected to foreign rule that its modus operandi has received all kinds of fanciful explanations. . . . In reviewing Brazilian tribes with regard to their alimentation, acclimatization, hygiene, etc., some light may be thrown upon those conditions which produced so great a mortality under emotional stress. . . . Spanish and Portuguese task-masters never understood how men more vigorous in appearance than their own peasantry could die from exertions to which the latter would have been fully equal, and still less did these strangers comprehend that innutrition was able to make mental depression as deadly as the worst forms of epidemic disease.' (From the chapter *Native Races*, in *United States of Brazil: A Geographical Sketch:* Washington, 1901.)

History.—A reference to each of the articles on the ten republics, and the general article AMERICA, will give the main facts in the history of the continent. A statement of the participation of English-speaking persons in the South American struggle for independence is all that needs attention here. This is well told in Lord Cochrane's account of his own services, and in *Diplomatic Relations of the United States and Spanish America,* by Prof. John H. Latané. Foreign officers—Europeans (not Spanish) and North Americans—who served in the patriot armies of Chile and Peru between 1817 and 1830 numbered 67, of which 21 were killed and 18

wounded. Very interesting are the following passages in a letter which Rufus King, the American minister to England, wrote to his government on Feb. 26, 1798: 'Two points have within a fortnight been settled in the English cabinet respecting South America. If Spain is able to prevent the overthrow of her present government, and to escape being brought under the entire control of France, England will at present engage in no scheme to deprive Spain of her possessions in South America. But if, as appears probable, the army . . . or any other means which may be employed by France shall overthrow the Spanish government . . . *England will immediately commence the execution of a plan long since digested and prepared for the complete independence of South America.* If England engages in this plan, she will at Philadelphia propose to the United States to coöperate in its execution.' That communication was never made; or, rather, if such a conspiracy was ever proposed, no record of it has been brought to our notice. Mr. Latané writes: 'Thirty years before the Spanish colonies began their war of independence, the British government had entertained the idea of revolutionizing and separating them from Spain. This idea . . . was frequently agitated (after 1779) with the avowed object of opening up South America to British commerce.' Of the patriot Miranda, Bolívar's forerunner, it is said that 'Arriving in New York from England in 1805,' Miranda went to Washington and laid his plans before the administration, having informal conferences with President Jefferson and Secretary of State Madison. Upon his return to New York, he represented that he had secured from the government a secret sanction of his contemplated invasion of Venezuela. In 1806 he sailed from the United States with an 'imperfectly equipped force of about 200 men.' Mr. Jefferson and Mr. Madison denied having in any way committed the government to Miranda's undertaking. The British government lent its encouragement, through Lord Cochrane, to the filibustering expedition from the United States to Venezuela, and also sent much stronger British forces, not 'imperfectly equipped,' against the provinces of Rio de la Plata. The Argentine naval force, under command of an Irishman named Brown, on May 16, 1814, defeated and almost entirely destroyed the Spanish squadron stationed at Montevideo. Through its agent in London, the Chilean government secured the services of Lord Cochrane, who lent invaluable support to Gen. San Martin in the campaign on the Pacific coast. The brilliant feat by which the Argentine leader made himself the liberator of the south, as Bolivar was of the north, is described by Mr. Latané in a sufficiently striking passage: 'On Jan. 17, 1817, Gen. José de San Martin began the passage of the Andes [from Argentina to Chile] with about 5,000 men, 1,600 horses and 9,000 mules, the latter carrying the field artillery, ammunition

and provisions. The summit of the Uspallata Pass is 12,700 ft. above sea level, 5,000 ft. higher than the Great St. Bernard by which Napoleon led his army over the Alps. In many other respects San Martin's achievement was more remarkable. Each piece of artillery had to be carried suspended on a pole between two mules, or, where the road was particularly dangerous, dragged by ropes. There were chasms that could be crossed only by cable bridges. The march over the Andes occupied three weeks. Both men and animals suffered greatly from *soroche*, the illness caused by rarefied atmosphere.'

The Spanish colonies were regarded as possessions of the Spanish crown, rather than of the nation, on account of the nature of the grant by Pope Alexander VI., when establishing the line of demarcation. When King Charles IV. and Prince Ferdinand were compelled by Napoleon to renounce forever the crown of Spain and the Indies, the colonists claimed that they were 'not politically a part of Spain, but connected only through the sovereign, and that with the removal of the sovereign the connection ceased.' The regency of Cadiz, of course, maintained the contrary in opinion and action; and by the close of 1815 the insurrections were suppressed everywhere but in La Plata. There the movement was beyond control, and then San Martin carried both force and inspiration across the Cordilleras into Chile, and later to Peru. Foreign volunteers were South America's teachers; through 20 years of heart-breaking warfare the Spanish-Americans made belated preparations to deal decisive blows; and when at last they had learned their lesson and were ready to begin, a single well-planned battle—that of Ayacucho—brought the great series of little contests almost to an end. Perhaps never before has it been so thoroughly demonstrated that wars with untrained contestants resembled the arguments of witless speakers—which are interminable, owing to the failure to see distinctly the vital points at issue, and lack of ability to attack them, winning or losing promptly.

The practical impossibility, during the earlier stages of the evolution of the South American republics, of curbing the power of the presidents (so often dictators in all but the name, even when the obnoxious title has neither been accepted by them nor commonly applied to them) has been vigorously set forth by nearly all writers whose standards are found exclusively in the much more rapidly evolving United States. For the most important records of the struggles in the several communities to reduce the executive power to its due proportions in relation to the legislative and judicial branches of the government, and to the people themselves, we must search the texts of the national constitutions. For example, the bitterness of Paraguay's unparalleled experience has borne fruit in the constitutional provision (Article 13) that 'Dictatorship shall be unlawful and inadmissible . . . and any one who may propose to establish it or

[who] consents or subscribes to its establishment shall be held to be an infamous traitor to the country, and liable therefor to the proper penalties.' On the other hand, Colombia's misfortunes have not yet erased from her constitution Article 121: 'In case of foreign wars or civil commotion the president may, after consultation with the council of state, and with the written consent of all the ministers, declare the public order to be disturbed, and the whole or a part of the republic in a state of siege. After such declaration the president shall be invested with the powers which the laws confer upon him to defend the rights of the nation or to repress disturbances; and, in case the laws are defective, he shall use the powers conferred by the law of nations,' etc. It is to be said, however, that the dictatorial powers thus conferred are qualified in their bearing upon the negotiation of treaties by Title XI., Art. 120, x., and passages in other parts of the constitution. The emergence of one of the less progressive countries—the 'voluntary' appearance of Venezuela 'at the bar of that high court of international justice and international peace,' The Hague Tribunal—is characterized in the first article in the *North American Review*, dated Dec., 1903. See also *An Americanist's View of South American Problems* in the same review, 1904.

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SOUTHAMPTON, *sŭth-ămp'ton:* municipal and parliamentary borough, important seaport, and county of itself, in s. Hampshire, England; 78 m. s.w. of London by the London and Southwestern railway. It occupies a peninsula at the head of Southampton Water, and be-

tween the estuary of the Test or Anton on the w. and s., and the mouth of the Itchen on the e. The High Street, the principal thoroughfare, extends from the water-side to the Bargate, and thence to the outskirts of the town. Crossing the High Street at right angles are many important streets and handsome lines of new houses are in the n. and w. suburbs. St. Michael's Church, oldest in the borough, contains Norman tower arches; and several private houses are of Norman architecture. The *Domus Dei*, or God's House, dates from the end of the 12th c., and is one of the earliest hospitals in England. The docks can float the largest steamers, and have been greatly extended and improved. Southampton is the place of departure and arrival of the West India and Brazil, the Mediterranean, East Indian, China, and Australian, and the South African mail steam-packets. There is considerable traffic between Southampton and the Channel Islands and French coast, also a large cattle-trade with Spain and Portugal. Its harbor is perhaps the most motley and picturesque in England, being frequently crowded with Lascars, Creoles, Arabs, etc., and, on the arrival of mail-steamers, with Indian and American planters, East Indian nabobs, foreign dignitaries, naval officers, and other British and foreign officials in every variety of costume. Yacht and shipbuilding and engine-making are actively carried on. Southampton is also a fashionable resort in summer. Pop. (1901) 104,-911.

Southampton supplanted the ancient *Clausentum*, which stood about 1 m. n.e., and its foundation is ascribed to the Anglo-Saxons. It is called Hamtune and Suth-Hamtun in the Saxon Chronicle. After the Conquest, Southampton, whence there was ready transit to Normandy, began to prosper rapidly, and in early times it traded with Venice and Bayonne, Bordeaux and Rochelle, Cordova and Tunis. A great part of it was burned by the combined French, Spanish, and Genoese fleets 1338; and in the following year its defenses were strengthened. Southampton is the birthplace of Isaac Watts (to whom a monument has been erected in the West Park) and of Thomas Dibdin.

SOUTHAMP'TON, Henry Wriothesley, third Earl of: 1573, Oct. 6—1624, Nov. 10; b. England: statesman. He accompanied the expedition of the Earl of Essex to Cadiz 1596; was general of cavalry under that earl in Ireland 1599; under charges of complicity in the insurrection in London headed by the earl, he was convicted and sentenced to death, and attainder was pronounced; but he was relieved of the death penalty by Queen Elizabeth, and of the attainder by parliament after the accession of James I. He co-operated with Sir Walter Raleigh in the colonization of America, sending out the *Concord* expedition under Bartholomew Gosnold at his own expense; interested Lord Arundel and Cecil Calvert in the

development of the new world; joined Lord Arundel in sending an expedition to New England; and became governor of the Virginia Company. He supported religious liberty firmly, and was an acknowledged patron of Shakespeare, who dedicated to him his *Venus and Adonis* (1593) and *The Rape of Lucrece* (1594).

SOUTHAMP'TON WATER: fine inlet of the English Channel, stretching n.w. from the point at which the Solent and Spithead unite; 11 m. long and about 2 m. wide. The Isle of Wight, between Southampton Water and the Channel, forms a magnificent natural breakwater, and occasions a second high water two hours after the first. Southampton Water receives the Test or Anton, Itchen, and Hamble rivers.

SOUTH AUSTRA'LIA: an 'original state' of the Australian commonwealth, comprising the whole central section of Australia; extreme length n. to s., 1,850 m.; width w. to e., 650 m.; 903,690 sq.m.; cap. Adelaide.

Character of the Soil, etc.—The n. portion of this vast territory has abundant rainfall; and is watered by numerous streams and rivers, some, e.g., the Victoria and the Adelaide, navigable for a considerable distance by ships. The soil is fertile, and suitable for tropical productions of every kind. In connection with the construction of the overland telegraph across the centre of the Australian continent, this region has become known as suitable for settlement.

The great central region opened by explorations of Stuart and M'Kinlay, and the country n. of lat. 33°, are suited only for pastoral purposes, on account of irregularity of rainfall and scarcity of permanent water; and except a few patches along the coast, the same description applies to the country w. of Gulf St. Vincent in 138° e. long. The s.e. division of the colony, between lat. 33° and the Southern Ocean, and between Gulf St. Vincent and the e. boundary of the colony, includes every variety of soil, ranging from absolute sterility to the highest degree of fertility— much of it being probably unsurpassed by any region in adaptability both in soil and in climate for growth of wheat, the vine, and the olive. This region is moderately timbered; the principal varieties being the gum, the stringy bark, and the pine, all useful for fencing and building purposes.

Climate.—A country extending over 27° of latitude must necessarily embrace great varieties of temperature; but the climate, owing to prevailing aridity, appears on the whole, healthful, and remarkably free from epidemic diseases. The average annual mortality during ten years has been found, in the settled districts, 15 per 1,000 as compared with 22 per 1,000 in England. Nearly half of the deaths are of children. The hottest months are Dec., Jan., Feb., and March. During these months, hot winds occasionally blow. But the same dryness of the air which accounts for the great exaltation of the temperature renders it more endurable than might at first be supposed;

and Europeans are able in the hottest weather to carry on harvest-labor without danger. Careful observations, in the agricultural part of the colony (i.e. s. of lat. 33°), and extending over a series of years, show the mean temperature during the four hot months to average 73·60°, and during the eight cold months, 56·30°, the extreme range being 117°-32°. The rainfall in the n. or purely pastoral district is as low as 7.947 inches; while in the s. or agricultural district it averages as much as 48.59 inches.

Physical Aspect.—The surface of the country alternates between open plains and wooded ranges of moderate elevation, which inclose many beautiful and fertile valleys. The principal ranges are the Flinders range, which trends n. from the e. coast of Spencer Gulf to the neighborhood of Lake Torrens, lat. 30°, where it branches out into numerous spurs; and the Mount Lofty range, nearly parallel with Gulf St. Vincent from its head-water in lat. 34° to its termination at Cape Jarvis. The Mount Lofty ranges rise about 2,600 ft., running nearly n.e. and s.w., with breadth of more than 15 m. This district abounds in picturesque scenery, the summits being well wooded and the slopes of great beauty and fertility, affording eligible building-sites, and producing in highest perfection many English fruits and vegetables, which fail to thrive on the hotter and more arid soil of the plains.

Throughout South Australia the deficiency of running water is remarkable; in fact, for nearly 1,200 m. following the indentations of the coast from the w. boundary of the colony to the estuary of the Torrens, in Gulf St. Vincent, not even a brook of permanent fresh water finds its way into the sea. Eastward, this deficiency is to some extent compensated, partly by the streams which rise in the Mount Lofty range, the principal of which are the Torrens, the Onkaparinga, the Gawler, and the Sturt; but mainly by the Great Murray river. See AUSTRALIA; VICTORIA. Unfortunately for the complete utilization of this magnificent stream, its embouchure, long. 139° e., is exposed to the full force of the Southern Ocean, which, meeting the current, throws up a shifting bar, rendering the entrance from seaward dangerous, and practicable only for steamers drawing less than 7 ft. To counteract this drawback, a tramway has been constructed from Goolwa, connecting the river with Victor Harbor, a small but well-sheltered haven in Encounter Bay. Another railway connects North-West Bend, 150 m. up the river, with Port Adelaide; while a n. extension runs to Terowie, 140 m. inland.

Divisions, Towns, etc.—The state naturally falls into three sections—South Australia proper or the old portion; Central Australia and the Northern Territory, long. 129°-138° e., n. of lat. 26° s.; containing 523,355 sq.m., and added to the former South Australia 1863. The settled part of the colony is divided into 44 counties for electoral purposes; 33 municipalities; and 140 districts.

Beside Adelaide, the capital (pop. 100,000), Glenelg had about 3,000; Burra, 3,000; Kapunda, 2,500; and Gawler, 2,000. Port Adelaide, 7½ m. from the capital, is the chief harbor; but there are several excellent minor ports.

Mineral Wealth, etc.—The mineral wealth of South Australia is great, the principal metals being copper, lead, and iron; the last is of the finest quality, but in the absence of coal, cannot be profitably worked. There are many copper-mines at work, the principal being the Burra-Burra and the Kapunda, n.e. of St. Vincent Gulf; the Wallaroo and Moonta on York's Peninsula. Several gold-fields are worked, and mineral oil and marble have been found in paying quantities. The total yield of gold up to 1905 was valued at about $10,350,000, the production in that year being over 20,000 ounces; of silver, the production to 1905 was valued at about $750,000; and of copper at $120,000,000.

Colonization.—The country was selected 1837 as the site on which to test what was then a new principle in colonization, known as the Wakefield theory, from its author, Edward Gibbon Wakefield. The principle may be expressed in a single sentence thus: 'The waste lands of the crown, though entirely valueless prior to the application of labor and capital, acquire value according as these elements of wealth are applied to them in due proportions or otherwise; and the proceeds of the sale of these lands, if properly administered, will suffice to defray the cost of transporting the labor required for their cultivation, at the same time relieving the mother-country from the pressure of able-bodied pauperism.' A second and scarcely less important problem in economic science was put to the test on the same occasion—viz., 'The future revenues of a new colony, supplemented, if necessary, by a lien upon the lands, afford a basis of credit available for raising funds adequate to defray the cost of outfit and first settlement; and therefore the appropriation of the taxes of this country for such purposes is unnecessary and inexpedient.' Owing partly to an unfortunate delay in putting the first settlers in possession of the lands which they had paid for, but mainly to a monopoly by the government of the labor imported by the purchase-money of those lands, production was retarded during the first three years; and the necessaries of life, which might have been produced on the spot in abundance, had to be imported at enormous cost, and paid for out of capital—reducing the colony to the verge of bankruptcy. In 1841, the sound principles to illustrate which the colony was founded, were allowed to come into play. Government interference with the labor-market ceased; and within three years breadstuffs and other agricultural products were exported from South Australia in such quantities as to glut the markets which had previously supplied her necessities. From that date, the prosperity has been marvelous. South Australia has become the granary of the eastern settlements.

The waste lands are disposed of in fee-simple by public auction at the upset price of 20*s* per acre; and lands once passed the hammer may be purchased at that price without competition. For pastoral purposes, lands are granted to the first applicant for a lease of 14 years at almost nominal rent. The system of free selection within certain surveyed districts now obtains, whereby 640 acres can be purchased on credit, at the ordinary upset price, on written application to the land-office, and on the signing of an agreement whose main conditions are—immediate payment of 10 per cent of the purchase-money, and its payment in full in six years; or optionally, of half, on further interest on the remaining half, and the full payment in ten years; personal occupancy of the land; and the executing of improvements to the value of 7*s* 6*d* (about $1.85) per acre before the end of the third year, and of 10*s* (about $2.50) before the end of the fourth year. Land open to the public for one year without being sold may be leased in blocks of not more than 2 sq.m. for 21 years, with right of purchase at the upset price during the lease. The difficulties, delays, and expenses attendant on the English system of conveyancing are removed by the Torrens Act, and land is rendered as easy of transfer, mortgage, and settlement as property in shipping. The great advantages secured by South Australia under this act have caused it to be adopted throughout the Australian colonies.

In 1905 there were 1,339 manufacturing establishments in South Australia, employing 18,644 hands. The cattle numbered 520,379 head in 1905, including 88,826 dairy cows and heifers; and 200,241 horses; and the total value of dairy and swine produce was about $2,800,000. There were 2,275,506 acres under cultivation, of which 1,840,157 were under wheat, 269,626 under hay, 50,630 under oats, and 30,982 under other grain crops, the balance being devoted to potatoes, sugar cane, vines, etc. The production of grains in a typical year is about as follows: Wheat, 18,000,000 bushels; oats, 550,000 bushels; other grain crops, 450,000 bushels; hay, 300,000 tons; potatoes, 20,000 tons, and wine, 2,600,000 gallons. In 1905 the imports were valued at about $42,150,000 and the exports at $47,275,000, the exports of wool alone being valued at $6,500,000. The revenue of the state amounts annually to about $13,600,000 and the expenditures to $13,500,000.

Government, etc.—The legislative council and the house of assembly both are elective. Members to the council are chosen by electors with a small property franchise, for a period of 12 years; 8 members retire every 3 years. Members of the assembly are elected by universal suffrage, 52 every 3 years. Voting for both houses is by ballot, and the members of both receive $1,000 per annum salary. The executive government is dependent on parliamentary majorities, as in England. No pecuniary aid is given by government to any religion, and all

churches are on perfect equality. The system of public education is modeled on Irish national system. Attendance is compulsory.

The places of public worship in the colony number about 1,000. Schools number 284 public, 422 provisional, 290 private; pupils in all 69,115. Education is secular, compulsory, and free of charge. See an elaborate descriptive work, *South Australia*, by William Harcus (1876); Silver's *Handbook to Australia;* and the annual issue of the *Australian Handbook*.

SOUTH BEND: city, cap. of St. Joseph co., Ind.; on the St. Joseph river, and on the Chicago and Grand Trunk, the Lake Shore and Michigan Southern, the Michigan Central, and the Vandalia Line railroads; 85 m. e. of Chicago. It is attractively laid out and ornamented with handsome shade-trees, and has broad streets paved with cedar blocks, stone, brick, and native cement, and well graded and gravelled suburban roads. The city has long been noted for its manufactures, especially of carriages and wagons; and of 10 such establishments, one covers 83 acres and employs 1,500 men. There are 4 plow-works; sewing-machine case, clover-huller, boiler, steel-skein, pump, toy-wagon and croquet works, foundries and machine shops; and woolen, silk and shirt factories. In 1900 there were 302 manufacturing establishments of all kinds. Water-power is provided by the river which bisects the city. South Bend is supplied with water for domestic purposes by 62 artesian wells, of average depth 125 ft., controlled by powerful pumps. It is lighted with gas and electricity; has electric street railroads, and contains 32 churches; 13 public schools; 8 parish schools; 1 high school; the University of Notre Dame (Rom. Cath.), founded 1842, rebuilt after fire 1879; St. Joseph's Academy; St. Mary's Academy; the Academy of the Assumption; county court-house; public library; several hotels; conservatory of music; commercial schools; teachers' training school; historical society; government building; city-hall, $75,000; Y. M. C. A. building; Saint Joseph's Hospital; Saint Anthony's Convent; the city hospital; two theatres; banks; daily, weekly, and semi-monthly publications; tobacco factories; flour and grist mills, and foundries and machine shops. The principal industries are the manufacture of carriages and wagons and agricultural implements. It was settled in 1824 by Alexis Coquillard. It is in the region traversed early by the missionaries and explorers. Across the northern portion of the city was the old portage from the Saint Joseph to the Kankakee. La Salle visited here in 1679, and later years as he journeyed from the 'lakes' to the interior. He founded here an Indian village, the Miami tribe; but later the Pottawattomis occupied the place. South Bend was laid out 1831, with population 150, and began to be an important manufacturing place 1861. The government is administered under a special charter granted by the Legislature which provides for a mayor

and a council of 10 members. The members of the council hold office for a term of two years. Pop. (1900) 35,999; (1910) 53,684.

SOUTH BERWICK: Maine, town, York co.; on the Salmon Falls river, and on the Boston and Maine railroad; 40 m. s.w. of Portland. Its chief manufacturing interests include shoe factories, cotton and woolen mills, and carriage shops; there is a national bank with a capital of $100,000, and a savings bank. The town has a public library, and is the seat of Berwick Academy, a non-sectarian secondary school chartered in 1791. Pop. (1900) 3,188; (1910) 2,935.

SOUTH BETHLEHEM, *bĕth'lē-hĕm:* borough in Northampton co., Penn.; on the Lehigh river, and on the Lehigh Valley and the Philadelphia and Reading railroads; opposite Bethlehem, 5 m. e. of Allentown, 12 m. s.w. of Easton, the county-seat. It is in a region usually rich in zinc, iron ore, coal, and slate; and with valuable deposits of important stones, including limestone. Lying at the foot of the Lehigh Mountain, it commands a range of scenery as picturesque as any in Penn. South Bethlehem is the seat of Lehigh University, and has 13 churches, a young ladies' seminary, public schools, opera-house, 1 national bank (cap. $50,000), 1 state bank (cap. $500,000), manufactories of Bessemer steel, zinc, brass goods, boilers, iron and steel rails, shovels, silk and knitted goods, machinery, organs and foundry products, and 2 daily and 1 tri-weekly periodicals. Pop. (1900) 13,241; (1910) 19,973.

SOUTH'BRIDGE: town in Worcester co., Mass.; on Quinnebaug river, and on the East Thompson branch of the New York, New Haven & Hartford railroad; about 71 m. s.w. of Boston, and 21 m. s. by w. of the city of Worcester. It was settled about 1730 by people from Medfield, and included Sturbridge, Charlton and Dudly until 1801. It was incorporated as a poll-parish 1801, Feb. 28, as a town in 1816. The chief manufacturing establishments are optical works, shuttle works, wooden and cotton mills, knife works, and printing works. The government census of 1900 gives the number of manufacturing establishments 109; the capital invested, $4,269,358; wage-earners in manufactories, 2,871; annual wages paid, $1,225,064. The raw material for 1900 cost $1,884,004; and the output was valued at $3,854,638. Since 1900 the number of wage-earners, and the output have greatly increased. The town is an industrial and commercial centre of great importance. The principal public buildings are the town hall, public library, the Y. M. C. A. building, the churches and schools. There are seven churches, a high school, public and parish schools, and a fine public library. The government is administered by annual town meetings. The French Canadian element predominates. Pop. (1910) 12,592.

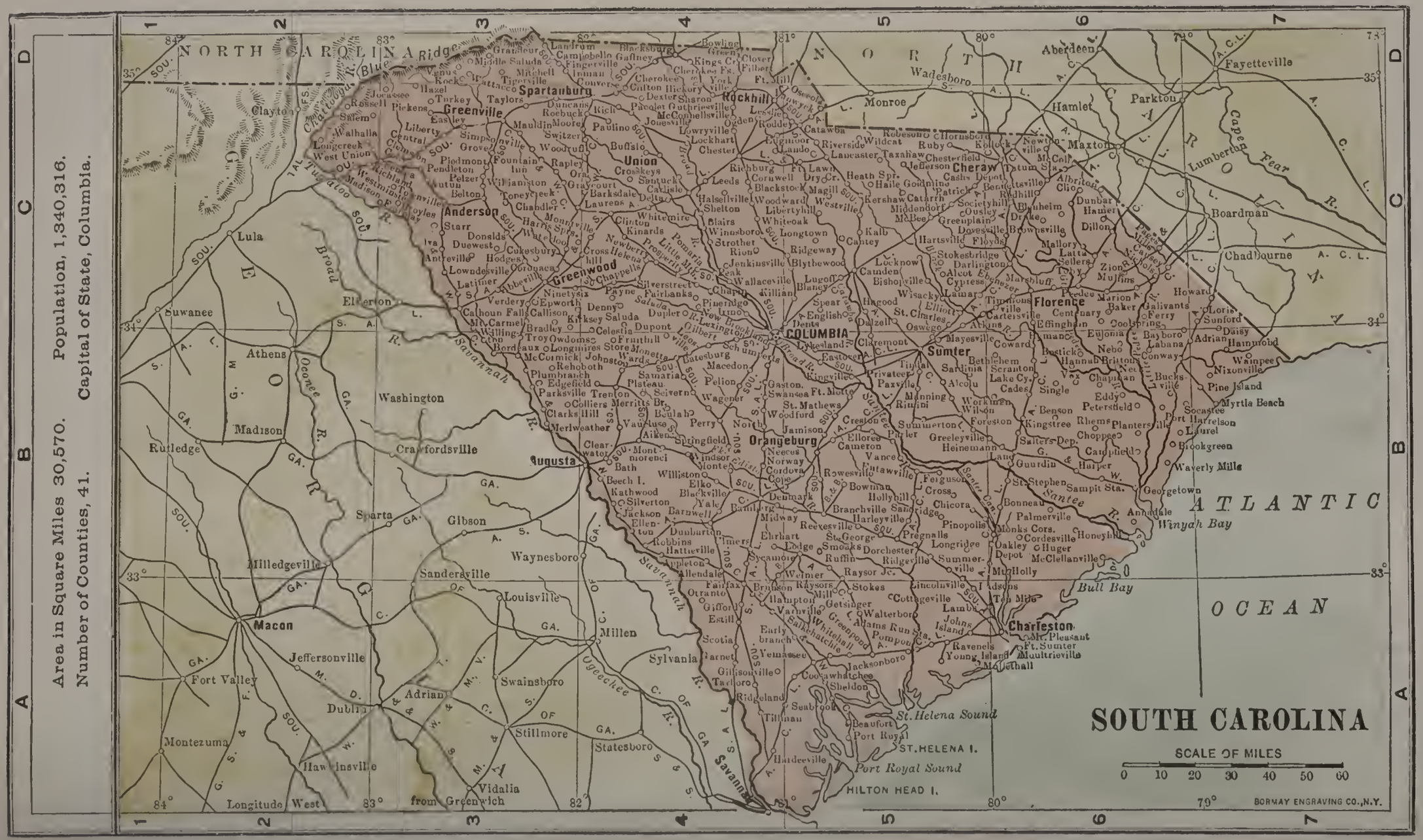
WM. T. ROLLESON.

SOUTH CAROLINA, *kăr-ō-lī'na* : state; one of the 13 original states in the American Union; s. part of the province of Carolina created 1663 by Charles II. of England; popularly known as 'the Palmetto state.'

Location and Area.—S. C. is in lat. 35° 31′—32° 4′ n., long. 78° 28′—83° 18′ w.; bounded n. and n.e. by N. C., e. and s.e. by N. C. and the Atlantic Ocean, s.w. by Ga.; shape, irregular triangle; extreme length 275 m.; extreme breadth 210 m.; coast line 200 m.; 30,570 sq. m. (19,564,800 acres); cap. Columbia.

Topography.—The face of the country discloses four peculiarities: (1) a string of low sea-islands lying off the coast s.w. of Charleston, and separated from each other and the mainland by shallow inlets; (2) a tract of sandy and quite level alluvial ground, with occasional swamps and marshes, extending about 100 m. back from the coast; (3) the middle or sand hill country, low and fertile, which rises to the 'ridge'; and (4) a more pleasant and diversified tract, successively terraced till it reaches the highest point in the state—Table Mountain (4,000 ft.)—in the Blue Ridge range. The state is well drained, the principal rivers rising in the Blue Ridge Mountains and flowing s.e. to the ocean. The most important rivers are the Savannah, which is the boundary between S. C. and Ga., the Great Pedee, the Santee, and the Edisto. The Savannah is formed by the Tugaloo and the Keowee, which, rising in N. C., unite in S. C. at Anderson, whence the main stream flows to the ocean 18 m. below Savannah. It is navigable for steamers to Augusta, 230 m., and small boats may proceed 150 m. further. The Great Pedee, known in N. C. as the Yadkin, empties into Winyaw Bay, and is navigable to Cheraw, 150 m., above which are falls. The Santee proceeds from a union of the Wateree and the Congaree in the centre of the state to the ocean, discharging through two mouths, the North and the South Santee. The Santee proper is navigable its entire length, and by its tributaries small boats may ascend nearly 300 m. from the ocean. The Edisto drains the central and s.e. parts of the state, and near the ocean is diverted by an island into two mouths. The coast line is indented by numerous bays, sounds, and inlets, some of which have large commercial and historic interest. The principal are Winyaw Bay (14 by 2 m.), Bull's Bay, Charleston Harbor, St. Helena Sound (10 by 3 m.), Stono Inlet, and Beaufort Harbor or Port Royal entrance. The sea-islands, noted for production of long-stapled cotton (considered the best in the world) and rice, are Black Oak, Bull's, Cape, Caper's, Cedar, Edisto, Hunting, Kiawah, North, and St. Helena.

Climate.—From the location of the state its climate would be supposed to be uncomfortably hot, but modifications by sea and mountain breezes produce a temperature similar to that in s. France. The rainfall ranges from 51–60 in. on the coast to 40–44 in. in the mountains, with 44–52 in. in the interior. At Charles


SOUTH CAROLINA
SCALE OF MILES
0 10 20 30 40 50 60
BORMAY ENGRAVING CO., N.Y.
Area in Square Miles 30,570.
Number of Counties, 41.
Population, 1,340,316.
Capital of State, Columbia.
NORTH CAROLINA
ATLANTIC OCEAN
Columbia
Charleston
Greenville
Spartanburg
Anderson
Greenwood
Rockhill
Union
Cheraw
Florence
Sumter
Orangeburg
Augusta
Macon
Aberdeen
Fayetteville
Parkton
Maxton
Hamlet
Monroe
Wadesboro
Boardman
Chadbourne
Lumberton
Clayton
Lula
Suwanee
Athens
Madison
Rutledge
Washington
Crawfordsville
Elberton
Sparta
Gibson
Milledgeville
Sandersville
Waynesboro
Louisville
Millen
Sylvania
Swainsboro
Stillmore
Statesboro
Jeffersonville
Fort Valley
Dublin
Adrian
Montezuma
Hawkinsville
Vidalia
Longitude West from Greenwich
Bull Bay
Winyah Bay
St. Helena Sound
Port Royal Sound
ST. HELENA I.
HILTON HEAD I.
Savannah R.
Santee R.
Pee Dee R.
Lumberton Fear R.
Cape Fear R.
Ocmulgee R.
Ogeechee R.
Chattooga R.
Blue Ridge

ton the mean annual temperature, noted for 30 years, was 65·6°, summer mean 80°, winter 52°, spring 66·3°, autumn 65°. Malaria prevails in the swamp and phosphate rock regions, and the region of Charleston has had epidemics of yellow fever.

Geology.—Primitive formations prevail in the n. portion of the state, and alluvial in the s. Porphyritic granite is found in the Camden and Buffalo creek regions; red granite near Columbia; syenites in Abbeyville, Fairfield, and Lexington counties; white and variegated marbles in Spartanburg and Laurens; gneiss in Pickens and York; red and yellow ochres in Chesterfield and Spartanburg and Laurens; manganese in nearly all the n. counties; coal in Chesterfield and Marlboro; gold in Abbeyville, Edgefield, Lancaster, Pickens, Spartanburg, Union, and York; lead in Pickens; black lead in Pickens and Spartanburg; and iron ore in several n. portions. In the lowlands the vegetation is sub-tropical, yielding the beautiful palmetto, bayonet-leaved shrub, magnolia, bay laurel, live-oak, and several other varieties of evergreens. Pine and cypress forests abound in gray spring moss, which floats lazily in the breeze. The usual forest trees of the middle states extend down to the uplands and mountain regions, the forests have abundance of valuable woods, 20 varieties of oak beside the live-oak, 5 varieties of pine, black walnut, cedar, hickory, chestnut, ash, and elm. There are 3,500 species of flora, a considerable part of which is medicinal. Grapes, canning and table fruits, and many varieties of nuts thrive. Excellent grazing is found in the n. counties, and dairying and stock-raising are becoming promising industries.

Zoölogy.—Numerous birds of prey abound, including the carrion and several other species of vulture, eagles, hawks, and gulls; some bears and wolves; and many raccoons, opossums, ground-hogs, rabbits, and squirrels. Game and aquatic birds in large variety are prolific; the rivers and coast waters afford excellent fishing; and the forests are alive with birds of song and rich plumage. There are also many varieties of reptiles, such as alligators and lizards; tortoises and turtles; and serpents, of which a few are venomous.

Agriculture.—There are about 200,000 farms in S. C., comprising over 15,000,000 acres, about two-fifths of which is improved land. The total value of all farm property, including lands, buildings, and improvements, implements and machinery, and live stock, is approximately $200,000,000. The principal crops are corn, wheat, oats, rye, hay, cotton, tobacco, and rice.

Manufactures.—There are about 1,500 manufacturing establishments in S. C., with aggregate annual outputs worth approximately $100,000,000. The principal industries are cotton goods; lumber and timber products;

cotton-seed oil and cake; fertilizers; lumber and planing mill products. The cotton industry is extremely valuable, ranking among the foremost in the country.

Minerals and Mining.—The principal mineral resource of the state is the almost inexhaustible quantity of phosphate rock, from which is obtained phosphate of lime, used in manufacturing commercial fertilizers. Beds of this rock underlie a region of coast 30 m. wide and 70 long, are found in many rivers flowing to the ocean, and in the streams that pass around the sea-islands, and crop out of the land on interior hills and in the depths of the swamps. River rock is mined by dredging; land rock by pick and shovel. The rock is found at a depth of 1-10 ft. below the surface of the ground, and ranges in thickness from a few inches to 3 ft. Inexhaustible quantities of building granite of fine quality occur in Fairfield, Newberry, Kershaw, and other counties. Mica slate is found in Abbeyville and Anderson. The peculiar soils known as the 'flatwoods' of Abbeyville, and the 'meadow lands' of Union, and also the 'black jack flats' of Chester and York, are due to the weathering of extensive trap dykes in those localities. Lieber writes in 1859, 'above this line (the "fall line") most streams have some gold in their sands.' Thirty-one gold mines have been opened in the talc slates of Chesterfield, Lancaster, Abbeyville, and Edgefield counties, the Dorn Mine (now McCormick), in the last named county, having yielded $1,100,000. There are 19 gold mines in the mica slates of Spartanburg, Union, and York counties, eight others, chiefly gravel deposits, in Greenville and Pickens counties. Argentiferous galena and copper are found in these mines, bismuth in quantity at Brewer Mine in Chesterfield county; iron in magnetic and specular ores in large quantities at Kings Mountain and elsewhere in Spartanburg and Union counties; limestone in York, Pickens, Spartanburg, and Laurens; in the latter county there are quarries of marble; feldspar in Pickens, Abbeyville, Anderson, and Laurens; barytes on the Air Line railroad in York; manganese in abundance and purity at the Dorn mine, and in Abbeyville, York and Pickens; asbestos in Spartanburg, Laurens, York, Anderson and Pickens; spinel rubies in Pickens; tourmaline in York, Edgefield, and Laurens; beryl in Edgefield and Laurens; corundum in Laurens; zircons in Abbeyville and Anderson; one diamond has been take from the itacolumite in Spartanburg. Recently tin ore in workable quantities has been found, and shipment of it has been made to England to be tested as to its value.

Commerce and Transportation.—The state has three ports of entry, Beaufort, Charleston, and Georgetown. The aggregate imports at these ports average about $2,500,000 a year and the exports about $3,500,000.

SOUTH CAROLINA OFFICERS IN THE REVOLUTIONARY ARMY.

Vessels aggregating over 150,000 tons annually enter and clear these ports. The first railroad in the U. S. which employed American-built locomotives was the S. C. railroad, built 1830-33. Subsequently growth has been reasonably rapid, until at present there is a total trackage of nearly 3,500 miles. There are also about 10 lines of electric and other street railway, operating over 100 miles.

Finance and Banking.—The total assessed valuation of property is $271,106,302, the tax rate $5.75 per $1,000, and the bonded debt $6,526,885. There are about 30 national banks, nearly 150 state banks, and a few private and savings banks.

Religion.—The Baptist is the strongest denomination in S. C., followed by the Methodist Episcopal, South; Presbyterian; Roman Catholic, etc.

Education.—S. C. spends about $1,500,000 annually in the maintenance of its public schools, in which there are about 325,000 pupils enrolled, with about 6,500 teachers. There are also normal schools, private secondary schools, colleges and universities—both co-educational and for men only—colleges and seminaries for women, and schools of theology, technology, law, medicine, and agriculture. The chief educational centre of the state is Charleston, where, besides the regular public schools, are schools of law and medicine and colleges. The chief educational institutions of the state, with the date of their opening, are as follows: the College of Charleston (non-sect., 1790), the Clemson Agricultural College (1893), Presbyterian College of S. C., Clinton Allen University, Columbia (A. M. E., 1881), South Carolina College, Columbia (non-sect., 1805), Erskine College, Due West (Assoc. Ref. Presby., 1839), Furman University, Greenville (Baptist, 1852), Newberry College, Newberry (Luth., 1858), Claflin University, Orangeburg, (M. E., 1869), and Wofford College, Spartanburg (Meth. Episc. S., 1854).

History.—The earliest settlement of what is now S. C. was made 1562 by a party of French Huguenots under Jean Ribault (q.v.), who, after discoveries in Fla., landed and erected a fort on an island in Port Royal Harbor, to which he gave the name Carolina in honor of Charles IX. of France. This settlement was short lived, and no further attempts were made to colonize for more than 100 years. In 1663 Charles II. of England created the province of Carolina, of what is now the states of N. C. and S. C., and seven years afterward the English made the first permanent settlement on the Ashley river, removing 1680 to the site of Charleston.

In 1685 French Huguenots made a second and successful settlement, and by emigration from Switzerland, Germany, and Ireland, the colonists increased rapidly in numbers. The early govt. was of the proprietary form, and till 1729 the people lived under a quaint constitution

prepared by John Locke (q.v.). Joseph West was the first nominal gov. of the lower part of the province (S. C.), appointed 1674. Like their fellow-colonists in the n. provinces, those of Carolina were subjected to various troubles from the Indians. They had their first Indian war 1680, and were victorious. Gov. West sold many Indian prisoners as slaves to W. India planters, and for so doing was removed 1683. An attempt to enforce the collection of quit-rents led to insurrections and the deposition of Gov. Colleton 1687. Shortly afterward a sea-captain from Madagascar gave the govt. a bag of seed rice, which, distributed and sown, was the beginning of the rice industry in the south. In 1702 Gov. Moore made an unsuccessful attempt to capture St. Augustine (held by Spain), and the province issued its paper money to pay the expenses of the campaign. In 1706 the Carolinians repulsed a French fleet at Charleston; 1715 they defeated the Indians in a severe battle, and drove them into Fla.; 1718 or 19 expelled the gov. and organized an independent govt.; and 1720 they became amenable to the crown by the act of parliament purchasing the proprietors' rights for $80,000. From that time till the dawning of the revolution the colony greatly prospered. In 1774 a provincial congress was called to act on the oppressive measures of Great Britain, and to choose delegates to the continental congress of 1774-5; and 1775, Sep., the royal gov. fled, and the provincial congress assumed all powers not conflicting with those of the continental body. During the war the severe battles of Fort Moultrie, Charleston, Camden, King's Mountain, Cowpens, and Eutaw Springs, besides minor engagements, were fought in S. C., the battle of Eutaw Springs being the last important one of the war. The first state constitution was adopted 1776, Mar. 26; the federal constitution was ratified 1788, May 28; and the first permanent constitution was adopted 1790, June 3. In 1832-3 an attempt was made to nullify acts of congress imposing a tariff (see NULLIFICATION OF UNITED STATES LAWS). S. C. was the first of the southern states to take action for dissolution of the Union, and the first to engage in open hostilities against the federal govt. 1860, Oct. 25, the state resolved to secede from the Union if Abraham Lincoln was elected president; Nov. 7 the legislature passed an act calling a state convention, which, Dec. 20, unanimously adopted an ordinance of secession; Dec. 24 the gov. proclaimed the dissolution of the union between S. C. and the other states; Dec. 27, state officers seized Fort Moultrie and Castle Pinckney; and 1861, Apr. 12, 13, Fort Sumter was bombarded and captured by Gen. Beauregard. From this act till the close of the war the state suffered severely. The federal govt. took possession of Port Royal Harbor and Beaufort 1861, Nov.;

closely blockaded Charleston harbor; made an unsuccessful naval attack on Fort Sumter 1863, Apr.; besieged and demolished Forts Sumter and Wagner Sep. 7 following; and occupied Columbia and Charleston 1865, Feb. 17. Reconstructive action was at once taken. A provisional gov. was appointed June 30; a state convention repealed the ordinance of secession and declared slavery abolished Sep. 13; a general election for state officers was held Oct. 18; a milit. govt. provided by congress was installed 1867; a convention adopted a new constitution which was ratified by the people; and the state was readmitted into the Union 1868, July 13.

Government.—The executive authority is vested by the constitution of 1868 and subsequent amendments in a gov. elected for 2 yrs., and a lieut.gov. similarly chosen. The lieut.gov. is ex-officio pres. of the senate. In case of the death, removal, or disability of the gov., the lieut.gov. succeeds to the office; and in case of the death, removal, or disability of the lieut.gov., the pres. of the senate, or in case of his disability the speaker of the house, succeeds to the office till the disability is removed or till the next general election. The legislative authority is vested in a general assembly, comprising a senate of 36 members elected for 4 years, and a house of representatives of 124 members, elected for 2 years. The judicial authority is represented by a supreme court, consisting of a chief justice and three associate judges elected by the general assembly for 8 years; 2 circuit courts (common pleas and general sessions), probate courts, justices of the peace, and such other municipal and inferior courts as the legislature may establish. Supreme court judges hold office for 8 years; circuit and probate judges for 4 years, justices of the peace for 2 years. There are also a sec. of state, comptroller-gen., atty.gen., state treas., and supt. of education, adjt. and inspector-gen., supt. penitentiary, supt. lunatic asylum, state reporter, and clerk supreme court.

The successive govs., with their terms of service, are as follows: Charles Pinckney 1789-92; Arnoldus Vanderhorst 1792-94; William Moultrie 1794-96; Charles Pinckney 1796-98; Edward Rutledge 1798-1800; John Drayton (actg.) 1800-2; James B. Richardson 1802-4; Paul Hamilton 1804-6; Charles Pinckney 1806-8; John Drayton 1808-10; Henry Middleton 1810-12; Joseph Alston 1812-14; David R. Williams 1814-16; Andrew Pickens 1816-18; John Geddes 1818-20; Thomas Bennett 1820-22; John L. Wilson 1822-24; Richard J. Manning 1824-26; John Taylor 1826-28; Stephen D. Miller 1828-30; James Hamilton 1830-32; Robert Y. Hayne 1832-34; George McDuffie 183436; Pierce M. Butler 1836-38; Patrick Noble 1838-40; B. K. Hennegan (actg.) 1840; John P. Richardson 1840-42; James H. Hammond 1842-44; William

Aiken 1844-46; David Johnson 1846-48; W. B. Seabrook 1848-50; John H. Means 1830-52; John L. Manning, 1852-54; James H. Adams 1854-56; Robert F. W. Alston 1856-58; William H. Gist 1858-60; Francis W. Pickens 1860-62; M. L. Bonham 1862-64; A. G. Magrath 1864-5; B. F. Ferry (provisional) 1865; James L. Orr 1865-68; Robert K. Scott 1868-72; Franklin J. Moses, Jr., 1872-75; Daniel H. Chamberlain 1875-77; Wade Hampton, 1877-8; W. D. Simpson 1878-80; Johnson Hagood 1880-82; Hugh S. Thompson 1882-86; John C. Sheppard (actg.) 1886; John P. Richardson 1886-90; Benjamin R. Tillman 1890-94; John Gary Evans 1894-97; William H. Ellerbe 1897-98; M. B. McSweeney 1899-1903; D. C. Heyward 1903-07; M. F. Ansel 1907-09; Cole L. Blease, 1909—.

Politics.—Elections are held Tuesday after 1st Monday in Nov. The legislature meets annually on 2d Tuesday in Jan.; no limit of session; paupers, insane, and persons convicted of treason, murder, or other infamous crime, or duelling, are excluded from voting. S. C. has 9 electoral votes. Her votes for president and vice-president have been cast as follows: 1788, George Washington for president 7 and John Hancock 1 and John Rutledge 6 for vice-president; 1792, George Washington for president 8 and John Adams 7 and Aaron Burr 1 for vice-president; 1796, Thomas Jefferson and Thomas Pinckney 8; 1800, Thomas Jefferson and Aaron Burr 8; 1804, Thomas Jefferson and George Clinton 10; 1808, James Madison and George Clinton 10; 1812, James Madison and Elbridge Gerry 11; 1816, James Monroe and D. D. Tompkins 11; 1820 James Monroe and D. D. Tompkins 11; 1824, Andrew Jackson and J. C. Calhoun 11; 1828, Andrew Jackson and J. C. Calhoun 11; 1832, John Floyd and Henry Lee 11; 1836, W. P. Mangum and John Tyler 11; 1840, Martin Van Buren and L. W. Tazewell 11; 1844 James K. Polk and George M. Dallas 9; 1848, Lewis Cass and W. O. Butler 9; 1852, Franklin Pierce and W. B. King 8; 1856, James Buchanan and J. C. Breckenridge 8; 1860, J. C. Breckenridge and Joseph Lane 8; 1864, no vote; 1868, U. S. Grant and Schuyler Colfax 6; 1872, U. S. Grant and Henry Wilson 7; 1876, Rutherford B. Hayes and W. A. Wheeler 7; 1880, W. S. Hancock and W. H. English 7; 1884, Grover Cleveland and T. A. Hendricks 9; 1888, Grover Cleveland and A. G. Thurman 9; 1892, Grover Cleveland and Adlai E. Stevenson 9; 1896, William J. Bryan and Arthur Sewall; 1900, William J. Bryan and Adlai E. Stevenson 9; 1904, Alton B. Parker and Henry G. Davis 9; 1908, W. J. Bryan and J. W. Kern 9.

Population.—(1790) white 140,178, free colored 1,801, slaves 107,094, total 249,073; (1800) white 196,255, free colored 3,185, slaves 146,151, total 345,591; (1810) white

214,196, free colored 4,554, slaves 196,365, total 415,115; (1820) white 237,440, free colored 6,826, slaves 258,475, total 502,741; (1830) white 257,863, free colored 7,921, slaves 315,401, total 581,185; (1840) white 259,084, free colored 8,276, slaves 327,038, total 594,398; (1850) white 274,563, free colored 8,960, slaves 384,984, total 668,507; (1860) white 291,300, free colored 9,914, slaves 402,406, total 703,708; (1870) white 289,667, colored 415,814, total 705,606; (1880) white 391,105, colored 604,472, total 995,577; (1890) white 462,008, colored 689,141, total 1,151,149; (1900) white 557,995, colored 782,321, total 1,340,316; (1910) 515,400.

SOUTH CAROLINA COLLEGE, the State College located at Columbia, S. C., chartered in 1801, and first opened in 1805. In 1863 the college was closed on account of the Civil War, many students having enlisted in the Confederate army, and the buildings were used as a hospital by the Confederate government. The charter was amended in 1865, departments of medicine and law added, and the name changed to the University of South Carolina; the unsettled political condition of the state led to the closing of the institution a second time in 1877. The next year the charter was again altered, and the university divided into two branches, South Carolina College at Columbia and Claflin College at Orangeburg (the latter for colored students); the branch at Columbia was opened in 1880 as the South Carolina College of Agriculture and Mechanic Arts. In 1882 several new departments were added and 'of Agriculture and Mechanic Arts' dropped from the name; the Law School was added in 1884. In 1887 the charter was changed for the third time, the name of University of South Carolina again adopted, and a College of Pharmacy, Graduate Department and Normal School added. In 1890 there was a fourth reorganization, the agricultural, mechanical, medical, and normal courses were discontinued, and the name changed to South Carolina College. In 1894 normal courses were added to the curriculum. The college now offers the following courses: (1) Four courses, classical, Latin-science, Latin-literature, and modern literature, leading to the degree of A.B.; (2) two courses, mathematical-physical, and chemical-biological, leading to the degree of B.S., also special courses in civil and mechanical engineering by the addition of certain studies to the mathematical-physical course; (3) three normal courses, one of four years, leading to the degree of A.B., one of three years and a special course of two years; (4) a two years' course in the Law School, leading to the degree of LL.B., and (5) a graduate course for the degree of A.M. The work of the last two years of the A.B. and B.S. courses is partial-

ly elective. The special normal course is strictly professional and includes practice work. There are also normal courses for teachers given in the spring. There are 12 scholarships, besides state scholarships for each county for normal students. The library in 1904 contained 33,783 volumes; the students numbered 225, and the faculty 16.

SOUTHCOTT, *sowth'kot*, JOANNA: curious specimen of the religious visionary: about 1750-1814, Oct. 29; b. in Devonshire, England; of humble parentage. In her youth she was a domestic servant, chiefly in Exeter; joined the Methodists, and becoming acquainted with a man named Sanderson, who claimed the spirit of prophecy, made similar pretensions herself, and received encouragement from some weak-minded clergymen of the Church of England. She was very illiterate. In 1792 she declared herself the woman driven into the wilderness, the subject of the prophecy in Rev. xii. She gave forth predictions in prose and doggerel, and many letters and pamphlets; these were published, and found many purchasers. She also issued sealed papers to her followers, which she termed her *seals*, and which were to protect them from the judgments of God in this life and hereafter. Among the thousands who received these with implicit confidence were men of good education and respectable position. At length she imagined herself to have symptoms of pregnancy, and announced that she was to give birth 1814, Oct. 19, at midnight, to a second Shiloh, or Prince of Peace, miraculously conceived, she being then more than 60 years of age. The infatuation of her followers was such that they received this announcement with devout reverence; provided an expensive cradle, and made other preparations. The expected birth did not take place, but Dec. 27 the woman died. A post-mortem examination showed that the appearance of pregnancy was due to dropsy. She was privately buried in London. Her followers—said to have numbered more than 100,000—clung to their absurd belief, and expected her to rise again from her 'trance,' and appear as the mother of the promised Shiloh. In 1851, according to the census returns, there were still four congregations of Southcottians in England: later census returns afford no information on this class of subjects; but the sect was not extinct 1860.—Probably the secret of this poor creature's influence lay in the fact that she was in earnest about her own delusions. The multitude of people in the world are lacking in earnest and absolute conviction; thus are always liable to be enslaved by those who are possessed by convictions, however grotesque.

SOUTH DAKOTA, *da-kō'-ta:* state: one of the United States of America; 40th in order of admission into the

Area in Square Miles, 76,850. Population, 401,570.
Number of Counties, 60. Capital of State, Pierre.

SOUTH DAKOTA
SCALE OF MILES
0 20 40 60 80 100
Longitude West from Greenwich
NORTH DAKOTA
MINNESOTA
IOWA
NEBRASKA
MONTANA
STANDING ROCK INDIAN RESERVATION
CHEYENNE RIVER INDIAN RESERVATION
PINE RIDGE INDIAN RESERVATION
LOWER BRULE IND. RES.
CROW CREEK IND. RES.
PIERRE
Aberdeen
Watertown
Huron
Brookings
Madison
Mitchell
Sioux Falls
Sioux City
Yankton
Vermillion
Deadwood
Lead
Blunt
Wasta
Dakota
Vesta
Eagle's Nest
Cave Hills
Lodge Butte
Grand R.
Little Eagle
Seim
Ashcroft
Camp Crook
Short Pine Hills
Slim Buttes
Thunder
Date
Rabbit Butte
Wedge Tent Butte
Bixby
Moreau
Gustave
Haystack Buttes
Deer's Ear Butte
Castle Rock Butte
Flint Rock Butte
Cheyenne Agency
Fox Ridge
Patched Skin Buttes
Sulphur Cr.
Cherry Cr.
Cheyenne
Bellefourche
Spearfish
Whitewood
Ft. Meade
Central City
Tinton
Englewood
Roubaix
Doyle
Predmont
Nemo
Pactola
Rochford
Silver City
Mystic
Redfern
Sheridan
Rapid City
Farmingdale
Hill City
Keystone
Hermosa
Custer
Fairburn
Pringle
Bakerville
Hot Springs
Buffalogap
Minnekahta
Edgemont
Cascade Sprs.
Oral
Lithia
Smithwick
Oelrichs
Eckard
Ardmore
Manderson
Pine Ridge
Porcupine
Kyle
Allen
Eagles Nest
Gamble
Rosebud
Stoneville
Whiteowl
Hardingrove
Manilla
Leslie
Lindsay
Fort Bennett
Fort Pierre
Werdle
Medicine Butte
Bovine
Nowlin
Phillip
Cottonwood
Reeluse
Interior
Westover
Presho
Vivian
Kennebec
Red Butte
Oacoma
Chamberlain
Pukwana
Edna
Iona
Gregory
Herrick
Bonesteel
Fairfax
Wagner
Greenwood
Springfield
Tabor
Running Water
Niobrara
Butte
Longpine
O'Neill
Plainview
Hartington
Laurel
Elkpoint
Jefferson
Burbank
Vermillion
Yankton
Meckling
Garrison
Spink
Nora
Dalesberg
Wakonda
Beresford
Alcester
Hudson
Centerville
Davis
Lennox
Worthing
Canton
Fairview
Chancellor
Tea
Monroe
Hartford
Brandon
E. Sioux Falls
Garretson
Baltic
Dell Rapids
Trent
Egan
Flandreau
Ward
Elkton
Bushnell
White
Astoria
Toronto
Estelline
Brandt
Dempster
Clear Lake
Altamont
Castlewood
Hazel
Watertown
Goodwin
Kampeska
Milbank
Big Stone L.
Traverse
Browns Valley
Sisseton
Wilmot
Bigstone
Summit
Corona
Waubay
Webster
Andover
Bristol
Ferney
Lily
Strand
Dexter
Kent
Rauville
Helgen
Garden City
Clark
Elrod
Watertown
Raymond
Naples
Castlewood
Willow Lake
Bryant
Erwin
Desmet
Lake Preston
Arlington
Bruce
Toronto
Brookings
Aurora
Ramona
Rutland
Wentworth
Colman
Madison
Roswell
Canova
Chester
Colton
Salem
Montrose
Alexandria
Canastota
Mitchell
Ethan
Emery
Bridgewater
Milltown
Parkston
Marion
Freeman
Parker
Hurley
Menno
Centerpoint
Hansen
Irene
Lesterville
Utica
Tyndall
Avon
Scotland
Tripp
Delmont
Armour
Stickney
Hillside
Platte
Harrison
Humner
Geddes
Wheeler
Whitewan
Echo
Lake Andes
Fairfax
Butte
Niobrara
Running Water
Hartington
Laurel
Plainview
O'Neill
Longpine
Sioux City
Jefferson
Elkpoint

Union, 27th under the federal constitution; created a state from the part of the territory of Dakota s. of the 7th standard parallel; admitted by presidential proclamation 1889, Nov. 2.

Location and Area.—South Dakota is in lat. 42° 40′—46° n., long. 96°—105° w.; bounded n. by North Dakota, e. by Minnesota and Iowa, s. by Nebraska, w. by Montana and Wyoming; extreme breadth n. to s., 225 m.; extreme length e. to w., 360 m.; 76,620 sq.m. (49,036,800 acres); cap. Pierre.

Topography.—The surface of South Dakota is in the main a rolling prairie. The Black Hills in the southwestern portion of the state constitute a mountainous region of about 3,500 sq.m. in extent. The altitude ranges from 962 ft. elevation at Big Stone Lake to 7,216 at Harney Peak, the average for the state being about 1,400 ft. The state is divided into almost equal parts by the Missouri river, which enters at near the center of the north line and traverses it to the extreme southeast corner, forming 120 m. of the southern boundary. The stream is navigable for eight months annually, but is scarcely at all utilized for commerce since the construction of railroads. East of the Missouri the soil is glacial clay, covered with a rich vegetable mold; west of the river the soil is chiefly a mold-covered clay created from erosion of the western mountains washed down by the preglacial ocean. The difference in conditions and flora are in consequence very marked. The Missouri valley proper is somewhat unique through the South Dakota region, owing to the unusual manner of its creation. The great trunk river, in preglacial times, ran down the present James River valley, but it was crowded out of its course by the ice sheet and compelled to run about the western edge of the glacier, which was arrested in its southwestern course at approximately the present channel of the Missouri. The flood thus carved out the present channel of the Missouri from the region of Fort Berthold, in North Dakota, until it reached its old channel at the mouth of James river near Yankton, in so doing exposing the underlying shales and geological strata to a depth of 500 ft. below the original surface. Thus the streams through this region flowing into the old trunk stream from the west were arrested in their courses where they fell into the new channel of the Missouri, and in consequence their valleys were eroded to a depth approximating the level of the Missouri valley. There are several important lateral valleys, as the Sioux, paralleling the eastern boundary, an excellent agricultural region, abounding in many lakes and having fine quarries of quartzite in the vicinity of Sioux Falls; the Vermilion river valley, west of the Sioux, extending from the central portion of the state to the Missouri, very rich agriculturally and having fine quartzite quarries at Spencer; and the James river valley, a very broad, rich prairie region, extending entirely across the state from

north to south, are all upon the eastern side of the Missouri. West of that river are the Grand, Moreau, Cheyenne, Teton, White and Keyapaha valleys, running from the western boundary down to the Missouri. This western region has come into settlement since 1904 and is demonstrating large agricultural possibilities. A feature of the trans-Missouri region is the detached buttes, reaching an elevation of 200 or 300 ft. above the present level of the plateau and indicating the extent of the erosion of the section.

Climate.—The records of the various United States signal-offices in the state show the following annual average temperature for 15 years: At Yankton, in the s., 45° 5′; Deadwood, in the w., 42° 1′; Huron, central from n. to s., 41° 8′; average temperature in coldest month (Jan.) at Yankton, 14° 1′; Deadwood, 21°; highest in state, 56°, lowest, 28°; average annual rainfall, Yankton, 28.43 in.; Deadwood, 28.23; Huron, 23.65. The winter seasons are cold, but the air is clear and devoid of humidity. There is little rain in winter, and while the snow lies crisp and hard, the falls do not aggregate as much in inches as in the eastern states. Spring opens early; farming operations generally begin late in March or early in April, and plowing continues till late in November. In summer the days are warm and the nights cool and invigorating. October is the most delightful month. The climate through the year is beneficial to sufferers from pulmonary, bronchial and malarial diseases. While the average rainfall is not far from 21 in. annually, it comes chiefly in the growing months. For a period of 20 years the average for the state by months has been:

	Inches.		Inches.
January	0.53	July	2.93
February	0.50	August	2.59
March	0.99	September	1.66
April	2.92	October	1.34
May	2.69	November	0.59
June	3.69	December	0.59

In the western section the rainfall is less than in the valleys of the east, but it comes seasonably, so that, as a rule, there is an abundance to mature crops. The government, however, has undertaken an extensive irrigation project at Belle Fourche, and has surveys for several other projects in the foot hills of the Black Hills, which will, when completed, place a wide area under water.

Geology.—The finest geological formations in the state are in the Black Hills region. Following the granite at Harney Peak, are archæan slates and schists, then Potsdam sandstone and cement, next carboniferous limestones; after them the Jura-Triassic formation (red beds), then the cretaceous sandstones, and lastly coal measures, oil veins, and salt rock. The economic properties are gold, silver, tin, copper, and mica in the slates and schists; gold, silver, and copper in the Potsdam sandstone; building stone in great variety, lime,

1. The Homestake Mine at Lead City.
2. The City of Deadwood.

and marbles in the carboniferous limestones; variegated sandstone and gypsum in the 'red beds'; and building stones, whetstones, and grindstones in the cretaceous sandstone. The deep erosion of the soil of the western portion of the state, exposing the shales of all of the earlier formations far down into the Paleozoic, and particularly in the Carboniferous and Jurassic systems, where are found the most remarkable fossil deposits on the continent, make South Dakota a region of unusual interest to the geologist and naturalist.

All of South Dakota, west of the Sioux and Vermilion valleys, is within the wonderful artesian basin, supplied through the Dakota formation of the earlier cretaceous at an average depth of about 1,200 ft. This formation outcrops in the Black Hills and along the slope of the Rocky Mountains, the outcrop being crossed by the upper waters of the Missouri near Great Falls. This outcrop drinks in, at the relatively high altitude, vast quantities of water from the dissolving snows of the mountains and from the rains of summer. The altitude of the outcrop gives the water great 'head' wherever the Dakota is perforated in the lower plains, so that the artesian wells of South Dakota have a hydraulic pressure at the surface varying from 60 to 200 pounds to the square inch, making them valuable for power, fire protection and many uses. There are about 3,600 high pressure wells in the state. In a wide area centering at Pierre these wells bear natural gas.

Agriculture.—The soils of S. D. are in general well adapted to agriculture and, save in the mountains, there is little waste land. Altogether there are about 60,000 farms, comprising over 25,000,000 acres, of which most is improved land. The total value of all farm property, including lands, improvements, and buildings, implements, and machinery, and live stock, is well over $300,000,000. The principal crops are corn, wheat, oats, barley, flax, hay, and potatoes. Eggs, poultry, and dairy products are also very valuable, as are honey, wool and hides. Minerals and stones are also largely produced, being worth considerably over $10,000,000 a year.

Manufactures.—Owing to the comparative newness of the country and the large interest in agriculture, S. D. has few manufacturies. Altogether there are not many more than 1,000 manufacturing establishments in the state, their aggregate annual output being estimated at over $15,000,000. Excluding mining in the Black Hills, the manufacture of flour and grist mill products is the largest industry in the state, other chief industries being cheese, butter, and condensed milk products; and printing and publishing. Most of the latter was the printing and publishing of newspapers and periodicals, of which there are more than 300 in the state. Other important industries are bread and other bakery prod-

ucts; cars and general shop construction; confectionery; foundry and machine shop products; malt liquors; lumber and timber products; tobacco, cigars, and cigarettes; and gas, illuminating, and heating.

Railroads.—There are altogether nearly 4,000 miles of steam railroad tracks within the state. The principal systems in operation being the Chicago, Milwaukee and St. Paul; the Chicago and Northwestern; the Great Northern; the Burlington and Missouri River; the, Chicago, Rock Island and Pacific; the Chicago, Milwaukee, St. Paul and Omaha; the Minneapolis and St. Louis; and the Illinois Central. There are also a few miles of electric street railway.

Finance and Banking.—The total assessed valuation of property, including both personal and realty, is $321,070,665; the tax rate is $4 per $1,000; there is no bonded debt. Private finances are in a flourishing condition. There are nearly 100 national banks, nearly 300 state banks, almost 50 private banks, besides some banking corporations.

Religion.—Numerically the Roman Catholic Church is the largest denomination in the state, followed, in order, by the Methodist Episcopal, Norwegian Lutheran; Congregationalist, German Lutheran, Presbyterian, Baptist, and Protestant Episcopal.

Education.—S. D. spends annually nearly $3,000,000 in the maintenance of its public schools, in which there are about 125,000 pupils enrolled, with over 5,500 teachers. There are public and private normal schools, private secondary schools, co-educational colleges and universities, and colleges and universities for men only, and schools of technology and law. The most prominent among the institutions for higher education in the state are Huron College, Dakota Wesleyan University University of S. D., S. D. Agricultural College, Redfield College, S. D. School of Mines, and the College of Law in the University of S. D. The State University, which is at Vermilion, the agricutural college, which is at Brookings, and the School of Mines, which is at Rapid City, together with all the state normal schools, are governed by a board of five regents, appointed by the governor, confirmed by the senate, and holding office for a term of six years. The act of Congress which created S. D. a state provided that two sections of land in each township should be set apart to form, by sale or by lease, a permanent school fund; this fund also to receive 5 per cent. of the proceeds of sales of unappropriated lands in the state by the federal government. In addition 72 sections of public land were given to the state for university purposes; 120,000 acres for agricultural colleges; 40,000 acres each for a school of mines, a reform school, a deaf and dumb asylum, an agricultural college, and state university; 80,000 for state normal schools; and 170,000 for general educational and charitable purposes. None of this land can be sold for less than $10 an acre.

Charities and Corrections.—These are managed by a board of control of three members, appointed by the governor. Among the most prominent charitable and corrective institutions are included the Hospital for the Insane at Yankton; the Hospital for the Feeble-Minded at Redfield; the School for the Blind at Gary; the School for the Deaf at Sioux Falls; and the reform school for juvenile offenders at Plankington. There are also private and denominational charities in the state.

History.—The South Dakota region was probably visited by Radisson and Groseilliers in 1654. Explored by LeSeuer in 1699 and by younger Verendrye in 1745. First settlement by French fur traders prior to 1790. Lewis and Clark, 1804, found substantial fur posts at Greenwood; on Cedar Island, in present Hughes county, and at mouth of Cheyenne. First permanent settlement made at Fort Pierre by Joseph La Framboise 1817. Explored for scientific purposes by Bradbury, 1811; Catlin, 1832; Maximilian of Nuweid, 1833; Nicollet and Fremont, 1838-9; Warren, 1855 to 1857. Fort Pierre, fur post, was purchased by the government and converted into a military establishment in 1855. First agricultural settlement Sioux Falls 1857. Territory created 1861. South Dakota was entirely Sioux Indian country and is still the home of a majority of that tribe, and its settlement was for many years retarded by that fact and the wars consequent upon it. The war of outbreak began in 1862, lasting four years, followed by the Red Cloud war from 1866 to 1868, and the Black Hills war from 1875 to 1877. Since then the Indians have lived quietly and inoffensively upon their reservations, except for a short period of religious excitement in 1890, when they were driven into a hostile attitude by the persecution of the military. They are now chiefly engaged in agriculture and other gainful avocations; are chiefly professors of Christianity, and all of the younger men and women and their offspring are educated. The full-bloods are rapidly decreasing, and in the passage of time the entire tribe will be assimilated into the body of the white population now pressing upon them from every side. The title to the soil has passed from the aboriginal owners from time to time until the Indian title to all but a small portion retained for reservations has been extinguished; the portion east of the Sioux river in 1851; from the Sioux to the Missouri as far north as Lake Kampeska in 1859; from Kampeska northward, except Sisseton reservation, 1868; Black Hills, 1876; Great Sioux, 1889; Sisseton, 1892; Yankton, 1894.

South Dakota became a state in 1889 under the same act of congress and proclamation of the president which admitted North Dakota, Montana and Washington.

Government.—The executive authority is vested by the constitution in a governor elected for 2 years; a lieutenant governor elected at the same time and for the same term, compensation double that of a state senator;

and secretary of state, state treasurer, auditor, superintendent of public instruction, commissioner of schools and public lands, and an attorney-general. Candidates for governor and lieutenant-governor must be qualified electors of the state, at least 30 years old, and residents of the state or territory for 2 years next preceding the election. In case of the death, impeachment, resignation or disability of the governor, the duties of his office devolve on the lieutenant-governor, and in case of the disability of the lieutenant-governor while acting as governor, the secretary of state becomes chief executive till the vacancy is filled or the disability removed. The legislative authority is vested in a senate of not less than 25 or more than 45 members, and a house of representatives of not less than 75 nor more than 135 members. Senators and representatives are elected for 2 years, and receive $5 per day during the session of the legislature and 10 cents mileage; sessions biennial; limit of regular sessions 60 days. The judicial authority is vested in a supreme court, circuit courts, county courts, and justices of the peace, and such other courts as may be created for cities and incorporated towns. The supreme court consists of 3 members elected for 6 years. The court selects from its number the presiding judge. The supreme court may by law be increased to 5 members. The salary is $3,000. There are 9 circuit judges, serving 4 years and receiving $2,500 annually. The state is divided into 41 senatorial districts, 37 of which have one senator each and 4 two, and 50 representative districts, with from 1 to 7 representatives each. Since 1889 the governors of the state have been as follows: Arthur C. Mellette, 1889-1893; Charles H. Sheldon, 1893-1897; Andrew E. Lee, 1897-1901; Charles H. Herried, 1901-1905; Samuel H. Elrod, 1905-1907; Coe I. Crawford, 1907-09; R. S. Vessey, 1909—.

Politics.—Elections are held Tuesday after 1st Monday in November. The legislature meets on Tuesday after 1st Monday in January biennially. Persons under guardianship, *non compos mentis,* insane, or convicted of treason or felony (unless restored to civil rights) are excluded from voting; and women qualified by age, residence and citizenship may vote at elections held solely for school purposes. South Dakota has 4 electoral votes, and they have been cast for president and vice-president as follows: 1892, Benjamin Harrison and Whitelaw Reid; 1896, William J. Bryan for president 4 and for vice-president A. Sewell and T. E. Watson 2 each; 1900, William McKinley and Theodore Roosevelt; 1904, Theodore Roosevelt and Charles W. Fairbanks; 1908, W. H. Taft and J. S. Sherman.

Pop. (1880) 98,268; (1890) 328,808, increase 230,540; (1900) 401,570; (1905) 455,185; (1910) 583,888.

SOUTH DAKOTA STATE COLLEGE OF AGRICULTURE AND MECHANIC ARTS: situated at Brookings

S. D. It was first opened in 1884, and is under the control of the same board of regents as the University of South Dakota (q.v.). It is co-educational. Courses are offered in agriculture, veterinary science, dairying, mechanical, electrical, and chemical engineering, architecture, domestic science, and general science; in addition to these technical and scientific courses there is a normal course, a business course, and a preparatory department. Military drill is also a part of the curriculum. Formerly two courses in agriculture were offered; in the year 1901-2 one course in agriculture was substituted for the two; this course requires work in one language, and includes certain practical studies not before offered, such as stock judging, blacksmithing, horseshoeing, etc. The degree of B.S. is conferred. The college farm and grounds contain 400 acres; in 1901 a new physic and engineering building and plant-breeding building was erected. The income is derived mostly from state appropriations and from the annual federal appropriation in accordance with the law of 1890. The state agricultural experiment station, which is connected with the college, receives a separate federal appropriation. The students in 1906 numbered 488; the professors and instructors, 39.

SOUTH DAKOTA, UNIVERSITY OF: the state university located at Vermilion. The first territorial legislature of Dakota located the University of Dakota at Vermilion in 1862; nothing further was done toward establishing the institution until 1881, when congress granted 86,000 acres to Dakota for a university when the territory should be admitted to the Union as a state; the citizens of Vermilion then erected a building and organized an academic department. This action was ratified by the legislature in 1883, the building accepted as a gift to the territory, and the university incorporated. The first classes were opened in 1882. In 1891 the name was changed to University of South Dakota. The departments include the preparatory and college department, the college of business, and the college of music. The regular college courses lead to the degree of A.B.; normal courses are offered, and in 1901-2 courses in civil and mechanical engineering were added. Military drill and instruction in military science are a part of the curriculum. The university admits women on equal terms with men. The government is by a board of 5 regents appointed by the governor and confirmed by the senate for a term of 6 years. The state geological survey is conducted in connection with the university. The income of the university is derived from the congressional land grant of 86,000 acres, of which it now has control, and from state appropriations; tuition fees are small. The library in 1906 contained 10,200 volumes, the students numbered 417 and the faculty 35.

SOUTHEY, *sowth'ĭ* or *sŭth'ĭ*, ROBERT: English poet of

minor rank, and prose-writer unsurpassed: 1774, Aug. 12—1843, Mar. 21; b. Bristol; son of a linen-draper. In 1788 he was sent to Westminster School by his maternal uncle, the Rev. Herbert Hill; there he much distinguished himself, but in 1792 a trivial insubordination led to his expulsion; and next year he was entered at Balliol College, Oxford, with a view to his taking orders in the church. This, however, he ultimately declined to do, having been led by sympathy with the French Revolution to depart from the orthodox civil and religious standards. In 1794 he left Oxford, having published the year before, in conjunction with his friend Robert Lovell, a small volume of poems, the first literary venture of a life thenceforward to be devoted to literature. Shortly afterward he received from Cottle £50 for his first poem of any length, *Joan of Arc.* 1795, Nov., he was married to Miss Edith Fricker of Bristol; Coleridge, with whom he had become intimate, on the same day marrying a sister. After passing some time with his uncle, Mr. Hill, who had educated him and was chaplain of the English legation in Portugal—during which visit he diligently studied the language and literature of that country and of Spain—Southey became a student of law at Gray's Inn. Here he worked at his new poem of *Madoc,* and learned nothing whatever of law, which pursuit he speedily relinquished. In 1801 he accepted a situation as secretary to the chancellor of the exchequer for Ireland; but the duties were distasteful to him; and he soon quit his situation, and finally betook himself to literature for his livelihood.

In 1804 he settled at Greta Hall, near Keswick in Cumberland, where he spent the remainder of his life, working with the regularity of a machine, happy in his family relations and his unremitting daily round of congenial though continuous toil. His biography thenceforward for 40 years, till the pen dropped from his fingers, might be summarized in the list of his works, which of itself would fill a page or two. In addition to these formal publications, he wrote largely for various periodicals, notably for the *Quarterly Review,* to which, from its establishment in 1809—having now become as violently conservative in his views as in youth he had been revolutionary—he was a constant and valued contributor.

In 1807, in consideration of his services to literature, a pension of £160 per annum was awarded him; and 1813, on the death of Mr. Pye, he succeeded him as poet laureate. Through Sir Robert Peel, 1835, he received a further pension of £300, and with it the offer of a baronetcy, which, however, he had the good sense to decline. His wife, who had been three years an inmate of a lunatic asylum, died 1837; and he was married two years afterward to Miss Caroline Ann Bowles (1786 1854), writer of simple poetry and similar prose. In that year softening of the brain came on, and his last four years were passed mostly in painful mental stupor.

Southey's poetry—except in a few of his shorter ballad-pieces—was never popular, and is now nearly forgotten. His chief poetic works are *Madoc, Thalaba, The Curse of Kehama,* and *Don Roderick;* the last two reckoned the best. In all of them are noble passages, in which an ample and stately rhetoric counterfeits with surprising success the pure instinct of music; but they rather skilfully illustrate the art and technic of poetry than breathe its essential life. As a prose writer, he ranks among masters; his style is easy, lucid, agreeable, nicely modulated throughout, and readily rising into eloquence on suggestions of sentiment and subject. Of all his multifarious writings, his little *Life of Nelson* seems most likely to survive as a classic: within its assigned limits, it is an almost perfect model of biography. Other excellent biographies are those of the poet Cowper, of Bunyan, and of Wesley. His Life and Correspondence, edited by his son, was published in 6 vols. (1849); a Selection from his Letters (1856); his *Correspondence with Caroline Bowles* (1881).

SOUTH FRAMINGHAM. See FRAMINGHAM.

SOUTH HADLEY, *hăd'lĭ:* town in Hampshire co., Mass.; on the Boston and Maine railroad; 2 m. e. of the Connecticut river, 8 m. s.w. of Amherst, 12 m. n. of Springfield. The river, 4 m. s. of the town, has a fall of 40-50 ft., around which a canal 2 m. long has been built, affording valuable water-power for important manufactories at the village of South Hadley Falls, and at Holyoke, on the opposite side of the river. South Hadley has 5 churches, high school, lyceum; cotton, woolen, paper, and saw mills; commands a fine view through the gap between Mt. Holyoke and Mt. Tom; and is the seat of Mt. Holyoke Seminary. Pop. (1910) 4,894.

SOUTH HOLLAND: Netherlands; a maritime province, bordering on the North Sea and bounded n. by the province of North Holland, e. by Utrecht, and s. by North Brabant. Area, 1,166 sq.m. Pop. (1901) 1,194,-463. See NETHERLANDS.

SOUTHINGTON, *sowth'ĭng-ton:* town in Hartford co., Conn.; on the Quinepac river, and on the New York, New Haven and Hartford railroad; 17 m. s.w. of Hartford, 20 m. n. of New Haven. It has several churches, high school, graded school, academy, banks, a semi-weekly newspaper; and manufactures general and carriage hardware, pocket cutlery, silver-plated ware, etc. Pop. (1900) 5,800; (1910) 6,516.

SOUTH ISLAND: southern of the two large islands which, with the small Stewart's Island, form the British colony of New Zealand.

SOUTH KEN'SINGTON MUSEUM: an institution in London originated by the prince consort in 1852, and under the direction of the committee of council of edu-

cation. It contains a rare collection of ancient and modern art as applied to manufactures, a gallery of British art, an extensive collection of water-color paintings, a collection of sculpture, reproductions of ancient sculptures, and an art library. Other departments contain collections of substances used for food, and of materials employed in building and construction. The loan department is a special feature in connection with the institution. There is also a national art training school, and schools of science and cooking.

SOUTH KENSINGTON, NATIONAL ART SCHOOLS OF: London, England, connected with the Victoria and Albert, or (colloquially) South Kensington Museum, in Brompton, south of Hyde Park, are under the direction of the department of science and art. They have the advantage of special admission to the priceless collections of all kinds in the museums, which are carefully arranged for purposes of instruction.

SOUTH KINGSTOWN: R. I.; town, Washington co.; on the s.e. coast, and on the New York, New Haven and Hartford railroad. The town of Kingstown was settled and incorporated as early as 1674; it was divided into North Kingstown and South Kingstown in 1723. The colonial assembly met at South Kingstown at various times, and in 1790 the convention called to decide on accepting the United States constitution met here, but voted to adjourn to Newport. In 1780 South Kingstown was one of the wealthiest towns in the state; in 1900 the census reported 71 manufacturing establishments with a capital of $1,697,485; the industries include cotton mills and machine shops. Pop. (1910) 5,176.

SOUTH OMAHA, Neb., city in Douglas co.; on the Missouri river, and on the Chicago, Burlington and Quincy, the Chicago, Rock Island and Pacific, the Fremont, Elkhorn and Missouri Valley, the Missouri Pacific, and the Union Pacific railroads. Omaha is on its northern boundary. Seymour Park on the s.w., and the 'Fair Grounds' on the w. It has steamer connection with many of the cities and towns on the Missouri, thus adding to its shipping facilities, especially the opportunities for cheap freight transportation. It was chartered as a city in 1885.

South Omaha is practically a suburb of Omaha; its largest industrial interests are controlled mainly by Omaha firms and corporations; but the city has an independent municipal government. The plant of the Union Stock Yards Company, located here in 1884, is one of the largest stock markets in the country. The city is the greatest slaughtering and meat-packing centre in the United States, next to Chicago and Kansas City. The government census of 1900 gives as the number of manufacturing establishments 139; the total amount of capital invested in manufacturing, $16,471,329; the number of employees (not officials), 6,606; annual wages, $3,-

268,591; the amount paid for material, $61,277,486; and the value of the product, $70,080,941. The five wholesale slaughtering and meat packing establishments had (1900) invested a capital of $15,635,418; and the number of employees was 5,938. The annual wages paid the employees was $2,914,217. The amount paid annually for material was $60,021,201, and the value of the product was $67,716,724. A high school was established in 1887 and the public and parish elementary schools are well organized and equipped. Pop. (1910) 26,259.

SOUTH ORANGE: N. J.; village in Essex co.; on the Rahway river, and on the Delaware, Lackawanna & Western railroad; 5 m. w. of Newark, and 15 m. w. of New York. It was first settled in 1680, and was a part of the town of Newark until 1806, when the town of South Orange was separately incorporated. It is picturesquely situated among the Orange mountains, and has many fine residences, being a favorite place of residence for New York business men. Though largely a residential village, it has manufactures of hats and gelatin. It contains a handsome town hall (completed 1895), a public library, a public high school, and a Roman Catholic parish school. It is also the seat of two private schools for girls, and of Seton Hall College, a Roman Catholic institution, one of the dormitories of which was destroyed by fire 1909, Mar. 28. Pop. (1900) 4,608; (1910) 6,014.

SOUTH NOR'WALK: a city in Fairfield co., Conn.; on the Norwalk river, and on the Housatonic and the New York, New Haven & Hartford railroads; 2 m. s. of Norwalk, with which it is connected by street railroad; 14 m. w.s.w. of Bridgeport; 42 m. n.e. of New York, with which it has daily steamboat communication. It has 5 churches, opera-house, a military institute, ship-yard, iron-works, planing-mill, felt-hat, lock, shoe, paper, and box factories, and large oyster trade. There are 1 national bank (capital $100,000), 1 savings bank, and 1 daily and 1 monthly newspaper. Pop. (1890) 6,000; (1900) 6,591; (1910) 8,968.

SOUTH'PORT: England; in Lancashire, a fashionable seaside resort on the northwestern coast, about 18 m. by rail n. of Liverpool. There is a fine beach as far as the latter town. The main street terminates in a public park, and the esplanade commands beautiful views of the Welsh Mountains. Attractive features are the Pavilion and Winter Gardens, which include an opera-house and concert-hall; marine drive and gardens; Cambridge Hall; Public Library and Art Gallery; Grecian town-hall; Victoria Baths, finest and largest in the kingdom; Victoria Schools of Art and Science; and hospital. There are numerous churches and about 200 schools; the museum stands in the fine botanic gardens. Pop. (1901) 48,087.

SOUTH PORTLAND: Maine; city, Cumberland co.; in the southwestern part of the state on the s. side of Portland harbor; connected with Portland by electric railway. It was originally a part of Cape Elizabethtown, and was separately incorporated as a city in 1889. It is in an agricultural district and the chief business of the city is derived from farming; it contains also marine equipment and iron and steel plants, and a small shipbuilding yard. It has a public high school, and is the seat of the State Reform School. The city government is vested in a mayor and a council of seven members elected annually.

SOUTHSAY, n. *sowth'sā:* OE. for SOOTHSAY.

SOUTH SEA SCHEME, THE: commonly designated the SOUTH SEA BUBBLE, a term peculiarly expressive of its hollow splendor and sudden collapse: financial scheme in Britain, originated 1711 by Harley, Earl of Oxford, to restore public credit, and to provide for extinction of the floating national debt, at that time £10,000,000. This debt was taken up by a number of eminent merchants, to whom the government guaranteed for a certain period the annual payment of £600,000 (being 6 per cent interest), which sum was to be obtained by rendering permanent a number of import duties. Also the monopoly of the trade to the South Seas was secured to these merchants, who were accordingly incorporated as the 'South Sea Company,' and at once rose to a high position in the mercantile world. The extravagant ideas current respecting the riches of the South American continent were carefully fostered by the company; and a general avidity to partake in the profits of this most lucrative speculation sprang up; though the company's trading projects had no other result than a single voyage of one ship 1717. Notwithstanding this default, the company had obtained popular favor, and its shares rose day by day. Far from being alarmed at the expected and impending failure of a similar project—the Mississippi Scheme—the South Sea Company believed in the feasibility of Law's scheme, and resolved to avoid what they considered as the errors which had caused his downfall. Trusting to the possibility of pushing credit to its utmost extent without danger, they proposed, in the spring of 1720, to take on themselves the whole national debt (then £30,981,712), on being guaranteed 5 per cent per annum for 7½ years, at the end of which time the debt might be redeemed if the government chose, and the interest reduced to 4 per cent. The directors of the Bank of England, jealous of the prospective benefit and influence thus to accrue to the South Sea Company, submitted to government a counter-proposal; but the more dazzling nature of their rival's offer secured its acceptance by parliament—in the commons by 172 to 55, and (Apr. 7) in the lords by 83 to 17—against the protests of a few eminent men. During the passing of their bill,

the company's stock rose steadily to 330 on Apr. 7. Till this date, the scheme had been honestly promoted; but now the directors threw aside all scruples, and used all means, honest or dishonest, for giving fictitious value to the stock. The shares were quoted at 550 May 28, and 890 June 1. Thinking that the stock had reached its maximum, so many holders rushed to realize that the price fell to 640 June 3. The directors sent agents to buy up; and on the evening of June 3, 750 was the quoted price. Similar artifices had the effect of ultimately raising the shares to 1,000 in the beginning of August, when the chairman of the company and some principal directors sold out. Widespread uneasiness then seized the holders of stock; every one was eager to part with his shares, and Sept. 12 they fell to 400, in spite of all attempts of the directors. The consternation of those who still held their scrip became extreme; many capitalists absconded, either to avoid ruinous bankruptcy or to secure their ill-gotten gains; and the government became seriously alarmed at the excited state of public feeling. The bank refused to come to the rescue. The public excitement reached an alarming pitch; punishment of the fraudulent directors was clamorously demanded; and parliament was hastily summoned (Dec. 8) to deliberate on means of mitigating this great calamity. In an impetuous mood, an examination of the proceedings of the company was begun; and nine millions sterling of South Sea bonds were taken up by the bank, and a similar amount by the East India Company. The officials of the company were forbidden to leave the kingdom for 12 months, or to dispose of any of their property or effects. Ultimately, various schemes of the directors, involving deep fraud and villainy, were unearthed; and it was proved that the Earl of Sunderland, the Duchess of Kendal, the Countess Platen, and others in high position, had been bribed to promote the company's bill in parliament by a present of £170,000 of South Sea stock. The total amount of fictitious stock created for this and similar purposes was £1,260,000. Equally flagrant iniquity in high places in the allocation of shares was discovered. Most of the directors were imprisoned, and all suffered confiscation of their possessions. At the end of 1720, it being found that £13,300,000 of real stock belonged to the company, £8,000,000 of this was taken and divided among the losers, giving them a dividend of 33⅓ per cent; and by other schemes of adjustment the pressure of loss was distributed as fairly and widely as possible.

SOUTH SHETLANDS, *shĕt'landz*, NEW: group of islands in the s. Atlantic, about 600 m. s. of Cape Horn; lat. 61°—63° 50′ s. They are destitute of vegetation, except a species of moss. The chief are Smith, Livingston, Nelson, King George, Clarence, and Elephant Islands. Ice and snow lie at the sea-level all the year.

SOUTH SHIELDS. See SHIELDS, SOUTH.

SOUTHWARK. See LONDON.

SOUTHWEST TERRITORY: a territory of the United States, comprising all the region ceded by North Carolina (now Tennessee) and the narrow strip ceded by South Carolina. This was organized in 1790 as the Southwest Territory, with institutions resembling those of the Northwest, except for the admission of slavery. With the admission of Tennessee, in 1796, and the organization of the Mississippi Territory, in 1798, the Southwest Territory went out of existence.

SOUTHWORTH, *sowth'wĕrth*, EMMA DOROTHY ELIZA (NEVITTE): author: b. Washington, D. C., 1819, Dec. 26; d. 1899, June 30. She was married 1840 to Frederick H. Southworth, and taught school in Washington 1844-49. Later she made her home in Yonkers, N. Y., and afterward in Georgetown, D. C., where her death occurred. Her first story, *The Irish Refugee*, appeared in the *Baltimore Saturday Visitor*, and *Retribution* soon followed serially in the *National Era*. For many years by contract with the *New York Ledger* her stories appeared first in that paper. She was a very popular writer, and published about 60 novels, many of which were translated into German, French, and Spanish.

SOUVENIR, n. *sō'vē-nēr* [F. *souvenir*, remembrance—from L. *subvenīrĕ*, to come into one's mind—from *sub*, under; *venīrĕ*, to come]: a gift of affection; a keepsake; a remembrance; a memorial.

SOU'WESTER. See SOUTHWESTER, under SOUTH.

SOVEREIGN, n. *sŏv'ĕr-ĭn* [F. *souverain;* OF. *soverain* —from mid. L. *superānus*, chief, principal—from L. *super*, above: It. *sovrano*, uppermost, supreme]: an emperor; a king; a monarch; a supreme ruler; the person or body of persons in whom the legislative power of a state is vested. In limited monarchies, sovereignty is in a qualified sense ascribed to the monarch, who, though the supreme magistrate, is not sole legislator. SOVEREIGN, a. supreme in power; efficacious; effectual; chief; paramount; having no superior. SOV'EREIGNTY, n. *-tĭ*, supreme power; highest place. SOVEREIGN STATE, a country or state which administers its own government, and in which the legislative power is not trammelled by any other power—or, as in the states of the American Union, by any *foreign* power. The states of the German empire were designated *mi-souveraines*, because their sovereignty was qualified by their subjection to the imperial authority.

SOV'EREIGN: English gold coin of the value of 20 shillings sterling; standard weight 123.374 grains troy. The name was applied first to a gold coin issued in the reign of Henry VIII., otherwise called the double royal or rial, on which the king was represented in the royal robes. The name disappeared after a few reigns, and

was revived as applicable to the gold piece of George III., issued 1817, of the value of 20 shillings, which was substituted for the guinea, which had previously been current, of the value of 21 shillings. The gold value of the sovereign in the United States is $4.866½.

SOW, v. *sō* [AS. *sáwan;* Goth. *saian;* W. *hau;* Ger. *säen;* Dan. *saae;* Sw. *sada;* L. *satum,* to sow]: to scatter on the ground for the purpose of growth; to spread seed over tilled soil, as a field or garden; to spread; to scatter; to propagate. SOW'ING, imp.: N. act of scattering seed on the ground for propagation. SOWED, pt. pp. *sōd.* SOW'ER, n. *-ėr,* one who sows. SOWN, pp. *sōn.*

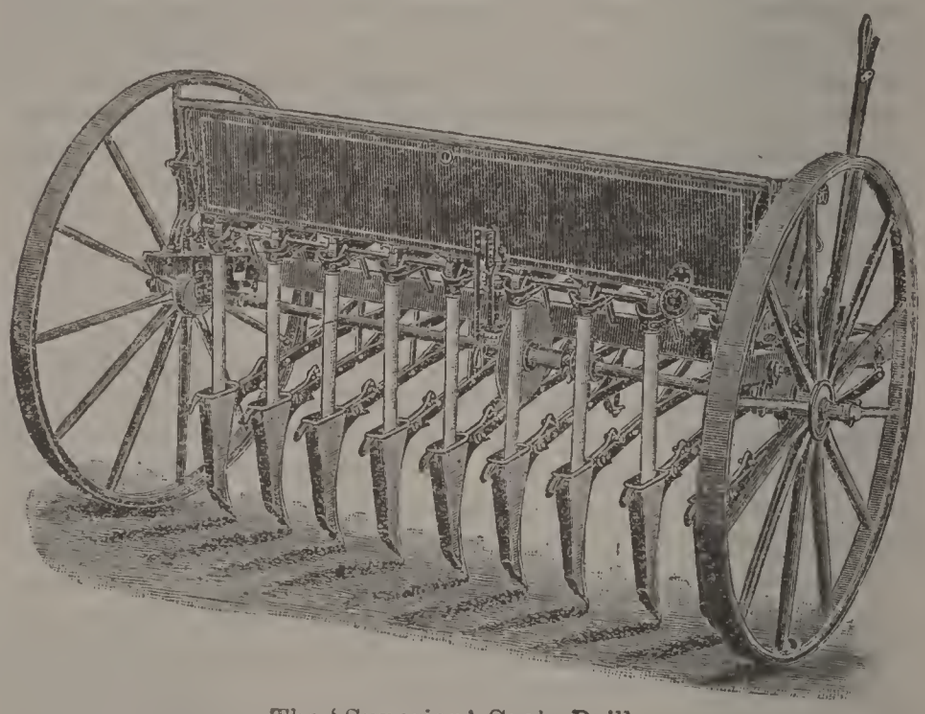
SOW, n. *sow* [Dut. *zog;* Low Ger. *söge;* Dan. *so;* Sw. *sugga;* Ger. *sau,* a sow: comp. W. *soga,* wallowing: L. *sus,* a sow]: a female pig or swine; the principal bar of crude iron in the cast run off from a smelting-furnace, the numerous small bars branching off from it on the right and left being called *pigs.* SOWBREAD, n. *sow'brĕd,* plant akin to the primroses, so named as being the favorite food of the wild boars of Sicily; species of the genus *Cye'lămĕn* (q.v.).

SOWER, *sō'ėr,* CHRISTOPHER: 1693-1758, Sep. 25; b. near Marburg, Germany: printer. He received a university education, studied medicine, came to America 1724, and engaged in the printing and book-selling business in Germantown, Pa., 1731. He established the first type-foundry and the first printing-ink manufactory in the United States; published the first quarterly magazine and the second edition of the Bible; and is credited with having made his own paper-stock, invented cast-iron stoves, and made tall 8-day clocks.

SO'WER, CHRISTOPHER: publisher: 1721, Sept. 26—1784. Aug. 4; b. near Marburg, Germany; son of Christopher Sower (b. 1693). At the age of 26 years he became a minister among the Dunkers, and from his 31st year till his death he was bishop or overseer. Having succeeded (1758) to his father's business, he issued the 2d edition of the great quarto Bible (Luther's version, in German) 1763, and the 3d edition 1776. His book-manufacturing establishment was far the largest in America at the time; and in addition to the business of type-founding, paper-making, etc., he carried on the manufacture and sale of certain medicinal preparations. Sower was a man of singular philanthropy and of many charities. He was one of the founders of the Germantown Academy. He was a conscientious opponent of slavery and war, and—for this reason, not favoring armed resistance—suffered confiscation of all his property, imprisonment, and many hardships, as one disaffected toward the popular cause. He refused to seek legal redress, supported himself by his daily toil, preached the gospel *gratis* to his people till his last hour, and died in poverty.

SOW'ING OF SEED: operation of depositing on, or in, the soil the seeds of plants. Sowing differs from planting in that it scatters the seeds either over the entire surface or in rows; in planting seeds, they are placed at certain distances apart. Sowing is done either by hand, which was the original and for a long period the only method, still largely employed even in countries in which agriculture has made greatest progress; or by machines, of which there are various forms. It may be either broadcast, in which the seed is scattered over the entire surface of the ground; or in regular rows called drills.

To render sowing reasonably effective, the ground must first be carefully prepared; neglect of this point is the cause of many failures of grain and fodder crops. By this preparation are secured, principally, suitable mechanical con



The 'Superior' Grain Drill.

dition of the land by plowing and pulverizing, prompt removal of an excess of water, and abundant supply of plant food. The quantity of seed must be such as to provide sufficient number of plants without crowding; and the quality of the seed is also very important. In some cases the use of means for destroying the germs of smut (see SMUT) or of other fungoid diseases is required The time of sowing is also of great moment, as seed sown too early may fail to germinate, or will yield only weak plants; while from that which is sown too late, fully ripened crops cannot be obtained.

Wheat, rye, and similar grains are more frequently sown broadcast, though in wheat-culture the drill system has been largely adopted and is growing in favor (see DRILL, in Agriculture). Machines for sowing do the work not only more rapidly but also much more perfectly than by hand. The hand-power broadcast machine sows a strip of ground one to two rods wide, according to the weight of the seed.

the heavier grains covering the greater distance: the seed is thrown from a rapidly rotating cup, and is distributed with great uniformity. The horse-power broadcast machines, which act on the same principle, can be attached to an ordinary farm-wagon; and will sow wheat and other heavy grains at the rate of 8 to 12 acres per hour. After broadcast sowing, whether by hand or by machine, the seed must be covered: this is done usually by a harrow, but sometimes by a bush or roller.

The advantages of drill over broadcast sowing are: more uniform covering of the seed, marked saving in the quantity of seed, freer admission of light and air to the growing plants, also in the cases of many crops, the opportunity which it offers for cultivation during the early period of their growth. Drill-sowing is done almost wholly with machines: of these, the ones for sowing the ordinary grain-crops are usually drawn by horses, though a few steam-machines are used, and sow several rows at a time. For sowing onions, carrots, and similar seeds, hand-machines, which sow one or two rows at a time, are commonly used. The machines, both power and hand, open the furrow for the seed, which passes through a tube or tubes to the ground, and is covered by the natural falling back of the earth or by metal wings arranged for the purpose. Many of the power-machines also have an attachment for distributing fertilizers. The distance apart of the rows can be varied by the operator. The objections to the narrow trench in which the seed was deposited have been overcome, in some patents, by use of broader shovels which leave the grain in strips 3 or 4 in. wide. Wheat sown in drills is sometimes, though rarely, cultivated. Drill-sowing is more general in England than in the United States. See DRILL, in Agriculture.

Another form of sowing, known as dibbling, formerly practiced to quite an extent in parts of England, consists in depositing seeds in holes made for their reception: see DIBBLE. The work was often done by hand, though various machines were invented for the purpose. The advantages claimed for this system were: considerable saving of seed, and greater facility in cultivating the crop; but as it proved expensive, and in various ways objectionable, it has largely been superseded by other methods. Plants cultivated in the garden are largely grown from seed sown in drills by hand. Here the preparation of the soil, application of fertilizers, time of sowing, and quantity and quality of the seed, require even more attention than in the case of field-crops. It is particularly important that finely pulverized soil be used for covering, and that, if the sowing is done in dry weather, the soil should be firmly pressed upon the seed.

SOWLE, or SOLE, v. *sōl* [Dut. *sollen*, to toss up and down]: in *OE.*, to lug, as by the ears; to drag forcibly.

SOW THISTLE (*Sonchus*): genus of plants of nat. order *Compositæ,* sub-order *Cichoraceæ,* having an imbricated involucre, swollen at the base, with two rows of unequal scales, which at length bend inward; a naked receptacle; the fruit transversely wrinkled and without a beak, the pappus hairy and without a stalk. The COMMON SOW THISTLE, *S. oleraceus,* abounds in most parts of Europe and the United States, as a weed in gardens and fields. The tender tops and leaves are used in n. Europe as greens.—The CORN SOW THISTLE, *S. arvensis,* is a perennial with large yellow flowers, frequent in grain fields.—Another species in the United States is *S. asper,* the auricles of the leaves rounded instead of acute. All these species, naturalized from Europe, have soft spines on the jagged leaves.—Nearly allied to the genus *Sonchus* is *Mulgedium,* to which belongs the ALPINE BLUE SOW THISTLE, *M. alpinum,* whose beautiful blue flowers adorn some of the inaccessible spots of the mountains of Switzerland and Scotland.—In the United States the species of *Mulgedium* are known as False or Blue Lettuce; *M. acuminatum,* 3-6 ft., has barely serrate leaves; *M. floridanum,* from Pennsylvania w. and s., has the lower leaves lyrate or runcinate; and *M. leucophæum* has a very compound panicle of flowers, pale blue.

SOY, n. *soy* [Japanese, *sooja*]: sauce or liquid condiment, originally prepared in the East. It is made from the seed of the SOY BEAN. The Japanese prepare from them a substance called *Miso,* which they use as butter.

Soy is made by mixing the beans softened by boiling with an equal quantity of wheat or barley roughly ground. The mixture is covered up, and kept 24 hours in a warm place, to ferment. The mass is then put into a pot, and covered with salt, the salt used being in quantity about equal to each of the other ingredients. Water is poured over it; and it is stirred, at least once a day, for two months, after which the liquor is poured off and squeezed from the mass, filtered, and preserved in wooden vessels: by long keeping, it becomes brighter and clearer. A Chinese sauce, called *Kitjap* (Ketchup), often named, and sold, as soy, is very inferior to the true soy.

SOY BEAN: a leguminous plant, *Glycine hispida,* sometimes incorrectly called soja bean, native to southeastern Asia. It has been cultivated from ancient times, and in some countries, notably Japan, it forms an important article of food. It was introduced into England in 1790, and into America some years later, where it was first grown principally in the southern States. Its use as a food for man has not become general except in its original home in Asia, and it is only within recent years that its value as a feed for stock has brought it to the attention of the western countries. The soy bean is an annual, 2 to 4 feet high. It has branching, hairy stems

with trifoliate, hairy leaves. The flowers are inconspicuous, of pale lilac or violet color, and the fruit is a broad, 2 to 5-seeded pod, covered, like the rest of the plant, with stiff, reddish hairs. The seeds vary in color according to variety. When grown for the seed the crop sometimes yields as high as 40 bushels or more to the acre, but the average is much less. As a forage crop it makes as high as 2 to 3 tons of cured hay per acre. The fact that the flowers are self-pollinated gives it an advantage over many other legumes in introducing it into new regions.

Soy beans require about the same conditions for growth as corn, but have somewhat better powers of resisting drought. The seed is not planted until the ground is thoroughly warm in the spring, and the earlier varieties are grown with fair results by planting after an early grain crop has been harvested. When planted for forage the seed is often sown broadcast, but where a crop of beans is desired it is better to plant in drills. The stage of growth at which to harvest depends upon the use to be made of the crop. In the United States the soy bean is grown exclusively as a feed for stock, in pasture, as a soiling crop, for hay, or as a green manuring crop. The green feed and hay are excellent for cows in milk. The beans are usually fed in the form of meal, and owing to the richness in protein and fats have been found of peculiar value in compounding feed rations. Fed in connection with less concentrated feeds and grains having a lower protein content, results have been obtained that show the soy beans to compare favorably in feeding value with cottonseed meal. The peanut is the only raw vegetable that contains as high a percentage of digestible protein and fat. The soy bean is prepared for use as human food in a variety of ways in Japan, where it furnishes the protein that is lacking in a diet of rice. The plant is also grown in Europe and used there to a limited extent as human food. Since the beans contain no starch they are sometimes recommended as food for persons suffering from diabetes; a soy-bean bread has been manufactured for this purpose. Under the name of coffee bean, the soy beans have been placed on the market in America as a substitute for coffee. In the United States the soy bean is best adapted to the southern and central States. It is not adapted to the States along the northern border or to the States west of the Rocky Mountains. In those States where it thrives it is especially valuable to soils that have become depleted of their nitrogen. The chemical composition of both bean and fodder adapts it especially to use as a balance ration in connection with corn, and makes its cultivation desirable where no other protein feed is available.

SOYER, *swâ-yā*, ALEXIS BENOIT: French cook: b.

Meaux, 1809; d. England, 1858, Aug. 5. Leaving Paris in 1830, he served the Duke of Cambridge, and became the chief of the Reform Club, 1837-50. In 1855 he went to the Crimea, reorganized the victualing of the hospitals, improved the food of the army and navy, and introduced cooking wagons. He was the most famous cook of his time and is immortalized as the Mirololant of Thackeray's Pendennis. His writings on cookery were widely read, and include *Culinary Relaxations* (1845); *Charitable Cookery* (1847); *History of Food in all Ages* (1853); *The Shilling Cookery Book* (1854).

SOYESHIMA, TANÉOMI: Japanese statesman; b. Saga, Province of Hizen. At Nagasaki in 1866 he studied under an American missionary, giving especial attention to the United States Constitution and the New Testament. In 1868 he became a commissioner for formulating laws and subsequently an imperial councillor. In 1871 he was sent to Siberia to adjust boundary questions relating to the island of Sakhalin. Returning to Japan he resigned his place in the cabinet, but was later asked to return to it. On a visit to China in 1876 he was received with high honors by the mandarins by reason of his scholarship, and he became private adviser of the emperor.

SOZOMEN, *soz'o-mĕn*, HERMIAS SALAMANES: Greek church-historian: b. probably not later than 400, in Bethelia, Palestine; of a distinguished family; well educated, he studied law at Berytus in Phœnicia, and practiced it in Constantinople. His history of Christianity, from Christ's ascension to A.D. 323, was lost. The 9 books of continuation to A.D. 439 remain; but deal much with monastic life and little with facts interesting to moderns; it seems largely copied from Socrates. An edition was published by Valesius 1659 (often reprinted), bound with the history by Eusebius and a continuation of the same by Socrates Scholasticus of Constantinople, who wrote about the time of Sozomen, and is somewhat more exact and trustworthy, though less elegant in style.

SPA, Belgium: in the province of Liège, 21 m. s. of the town of that name, a fashionable watering place, picturesquely situated, in an undulating country covered by woods, and containing wonderful medicinal springs. There are delightful promenades in the environs. The casino, bath-house, public squares and hotels are interesting features, besides a new parish church and the Gallery Leopold II., with its museum, music-halls, reading-rooms, etc. Gambling was prohibited in 1902. The town is renowned for its lacquer ware. There are tanneries, forges and foundries. Spa was early famous as a resort and frequented by Russian and Swedish potentates and all the fashionable world. The generic term for mineral baths was thus derived. The waters are exported to the most distant countries, and are efficacious in nervous

diseases, anæmic troubles, dyspepsia and general debility. Pop. (1900) 8,192.

SPACE, n. *spās* [F. *espace*—from L. *spatĭum*, space: It. *spazio*]: extension, as absolute (see SPACE AND TIME): extension, as in length, breadth, and thickness; room; distance; interval, as between lines; a quantity of time; a short interval: V. among *printers*, to make intervals between lines or between words; in *OE.*, to rove. SPA'CING, imp.: N. among *printers*, the adjustment of the distances between the words in a line. SPACED, pp. *spāst*. SPACIOUS, a. *spā'shŭs* [F. *spacieux*—from L. *spatĭōsus*, roomy]: having ample space or room; roomy; cast in extent; ample. SPA'CIOUSLY, ad. *-lĭ*. SPA'CIOUSNESS, n. *nĕs*, the quality of being spacious; largeness of extent.

SPACE AND TIME: the two most general conditions, forms, or attributes of all existing things. The discussion of Space and Time is linked with the profoundest problems of philosophy. Space is co-extensive with, and inseparable from, the sensible, external, or Object World; Time is a property of the Object World and of the Subject Mind.

Of the so-called Innate Ideas maintained by one school of philosophy, Space and Time are the foremost examples. (Other examples are Number, Infinity, Being, Substance, Power, Personal Identity, etc.) Accordingly it is held on one side, that these notions are underived, or intuitive to the mind; and, on the other side, that they arise in the course of our education or experience, like our ideas of heat, sound, color, gravity, etc.

SPACE.—The supporters of the innate or intuitive origin of the idea allow that it does not rise in the mind until actual objects, or extended things, are presented to the senses—until we see the visible, and touch the tangible things around us; but they declare that this contact with the sensible world is only the *occasion* of our becoming conscious of what was already in the mind. Thus, Mansel says: 'Space is not properly an *innate idea*, for no idea is wholly innate; but it is the innate element of the ideas of sense which experience calls into consciousness. It is, in short, the superadding of some independent activity of the mind to the passive sensation. The reasons usually given for assuming an intuitive element in the idea of Space are, in the main, the reasons given for innate ideas generally; they resolve themselves chiefly into affirming the attributes of *universality* and *necessity* in such ideas, and the inadequacy of mere sensible experience to reveal these high attributes of things. Whatever is got by experience can be thought away; space and time cannot. Thus, it is impossible for us to receive any sensible impression of an outward object—the sun, e.g.—without conceiving that thing as existing in space. To use the language of Kant, 'Space

is a form of our sensibility, or sensible perception,' and as the perception itself cannot, he thinks, give this universal and inseparable form, it must be contributed by the mind. Sir W. Hamilton supposes that we may have an 'empirical' notion of Space—i.e., a notion from experience; but that Space as a 'form' is not obtained from experience, but from intuition. He does not, however, explain clearly wherein consists the difference between these two notions.

A sharp distinction must be drawn between the idea of space as this appears in reflective thought and the acquaintance with space in unreflective experience.

Space as an idea is an abstraction from our experience of extended things, exactly as gravity is an abstraction from gravitating bodies, and justice from just actions. We first obtain from experience a variety of impressions, in the concrete, of things possessing extension; and, next, from all these, by the usual process of abstraction, we gain a notion of extension in the abstract, or Space. These two distinct operations involve matters of controversy.

1. Before the Muscular Feelings were distinctly recognized as something superadded to the proper perceptions of the senses—or the feelings of mere light, sound, etc.—it was not easy to show that, by sensible experience alone, we could perceive objects as extended, or as occupying Space. The pure optical sensibility of the eye is for color solely, the pure tactile sensibility is for softness and hardness, roughness and smoothness, etc. When, however, we make full allowance for the whole range of feeling connected with the exercise of muscular energy, there is no difficulty in accounting for the origin of such notions as Resistance (Force or Power) and Extended Magnitude. The element supposed, by the *a priori* philosophers, to be contributed by the mind itself, is, according to the other school, Muscularity, or the feeling of the putting forth of inward energy. The two senses most closely related to our cognizance of Space—Sight and Touch—are compound senses; they involve an active energy, with its peculiar consciousness, as well as a passive sensibility; and most of that which is characteristic of Extension, or Space, arises through these muscular accompaniments. Certain psychologists, e.g. James, hold that all our Senses yield us space experiences. The general view is that while all are suggestive of space, and perhaps all contribute directly some spatial elements, only sight and touch give us *complete* space experiences.

2. Having perceived a great number of things as extended, with the intervals of unoccupied extension that separate these, we form an idea of extension in the abstract. It has been said that the distinguishing peculiarity of this abstraction is related to *unoccupied* extension, or empty space, where we seem to have extension without anything extended; rendering the idea of Space unlike

other abstract ideas, as Gravity, or Justice, which are conceivable only as embodied in gravitating things, or just actions. All space known to science, however, is conceived either as filled with the continuous ether, or as the field of vast counter-poised forces. If infinite 'empty space' exists, it is only to such thought as deems the atmospheric spaces empty; and the common phrase 'infinite space' may have for its real meaning, infinite extension of being. Still, empty space is a convenient expression, setting forth such reduction of resistance as gives practically free scope for movement. To the senses alone, without the muscular accompaniments, Space would be a nonentity, an inconceivability; but the feeling of the sweep of the arm, or of the locomotion of the body, in passing from one point of resistance to another, is a genuine mental experience—the filling up of the interval between two tactile encounters or between two optical pictures, with conscious activity.

TIME.—The idea of continuance, or endurance, applies both to our feelings of energy put forth and to our sensations, emotions, and the flow of our ideas; in other words, it attaches both to the extended or Object World, and to the unextended or Subject Mind. In our muscular feelings, which represent the universe of matter and space, we discriminate a dead strain, or effort of resistance, lasting a short time, from the same strain lasting a longer time; also a more persisting movement from a less. So in the sensations: a sound enduring a second is different to us from a sound enduring two seconds; a transitory odor is not confounded with one of greater continuance. We distinguish two bursts of wonder, terror, love, or anger, if they have been unequal in their duration. Abstracting from all these experiences of continuance in the concrete, we obtain the idea of Time; which idea, however, like other abstractions, must be conceived by us under some individual continuing thing (see ABSTRACTION). If we were to imagine the whole outward universe annihilated, we should still have, in our own consciousness, an instance of the continuing, and upon that we could sustain the conception of Time. See GENERALIZATION.

Time is measured by Space, and Space by Time. The one is often expressed by the other, but with a certain limitation; we say a space of time, i.e., extent of time, but not a 'time of space,' though we have such equivalent expressions as 'three-hours' distance.' Movement is common to both. Of passive sensations, the best for indicating time are those of Hearing. All the senses can be used as a basis for judgments of Time. Hearing is most accurate for judging of short intervals like the second. Most of our judgments of long intervals are indirect, i.e. are based on the number of events we suppose to have occurred in an interval, or to our present bodily feeling, i.e., hunger. Our judgments of long intervals

are generally so inaccurate, that we have to rely upon clocks, watches, etc.

SPACE PERCEPTION: this subject is inevitably treated in part under numerous topics, such as Space, Sight, Touch, Illusions, etc., q.v. Only some of the most general aspects can be mentioned here.

The current theories of space perception are genetic and functional and therefore accord in the main with the doctrine of empiricism. There is difference of opinion as to whether or not 'extensity' exists as an undifferentiated but inherent quality of sensation; but all authorities are agreed that space perception is a capacity which is gradually developed by exercise, chiefly through the association of visual and tactual sensations with movement.

Some authorities hold that we have only two space senses; namely, sight and touch, the kinaesthetic sensations being included with touch. It is, however, probable that all the senses are, in some degree, capable of furnishing space perception, but the three named are especially adapted for this end, are most frequently used, and as a result contain most of our space imagery. Space perceptions through the so-called non-spatial senses are usually couched in terms of imagery of the dominating space senses; thus, one often has only a visual image of the position of an object which has been localized entirely by hearing. The different senses give us different spaces; thus, we have visual space, tactual space, arm space, etc., but these normally fuse and become unified in the perception of the object and its space relations. The space of one sense readily adapts itself to changed conditions, such as the wearing or inverting lenses before the eyes. There is often great disparity between the spaces of the different senses and there is no end to normal illusions within each space sense.

SPADE, n. *spād* [Ger. *spaten;* Dut. *spade,* a spade: Norw. *spode* or *spudu,* a small shovel: It. *spada,* a sword: L. *spatha;* Gr. *spathē,* a blade—*lit.,* a blade or broad piece of wood for digging]: a common instr. for digging in the ground; a suit of cards; V. to work with a spade. SPA'DING, imp.: N. the operation of digging or paring off with a spade. SPADE'FUL, n. *-fûl,* as much as a spade will hold. SPADDLE, n. *spâd'dl,* n. a small spade; a weed-hook. TO CALL A SPADE A SPADE, to call things by their right names; to be plain-spoken.

SPADE, n. *spād* [etym. doubt.]: a hart three years old.

SPADE-HUSBANDRY: preparation for, and cultivation of, crops by digging the ground. Its advantages over ordinary farming are a deepening and a more thorough pulverization of the soil. In the United States land is so cheap and labor so expensive as to preclude this system; and the use of improved agricultural implements

renders it unnecessary. The nearest approach which we make to this form of cultivation is Market-gardening, which is carried on to a considerable extent in the vicinity of every large city. By means of deep plowing, thorough fining of the soil, high manuring, and almost constant cultivation, very large crops are produced on limited areas.

SPADILLE, n. *spă-dĭl'* [F.]: the ace of spades at ombre and quadrille; also SPADILIO, *spă-dĭl'yō*.

SPADIX, n. *spā'dĭks*, SPADICES, n. plu. *spā-dī'sēz* [L. *spādix* or *spādīcem*, a palm-branch broken off together with its fruit, of a date or nut-brown color]: in *bot.*, a form of inflorescence in which the flowers are closely arranged around a thick fleshy axis, and the whole wrapped in a large leaf, called a spathe, as in the arum (see SPATHE). SPADICEOUS, a. *spā-dĭsh'ŭs*, of a clear reddish-brown color; red with a small admixture of gray; resembling a spadix.

SPAE, v. *spā* [Icel. *spa;* Dan. *spaae*, to foretell, to prophesy]: in *Scot.*, to foretell; to forebode. SPAE'ING, imp.: N. the act of foretelling; telling fortunes. SPAED, pp. *spād*. SPAE-WIFE, a woman who professes to tell fortunes by certain signs. SPAER, n. *spā'ĕr*, fortune-teller.

SPAGNOLET'TO: see RIBERA.

SPAGYRIC, a. *spă-jĭr'ĭk* [said to be from Gr. *spaō*, I draw; *ageĭ'rō*, I excite]: *semi-slang* for chemical. SPAGYRIST, n. *spăj'ĭr-ĭst*, in *OE.*, a chemist.

SPAHI, or SPAHEE, n. *spâ'hē* or *spâ'ē* [Pers. *sipáhí* (see SEPOY)]: formerly one of the Turkish cavalry. The Spahis were the cavaliers furnished by the holders of military fiefs to the Turkish army, and formed the élite of its cavalry. The Spahis, with the Janizaries (see JANIZARY), owe their organization primarily to Orchan, second of the Ottoman sultans, finally to Sultan Amurath I.; and when levied *en masse* could number 140,000, but such a levy was very seldom made. In the field, they were divided into two classes, distinguished by the color (red and yellow) of their standards; one class had pistols and carbine, the other a bow and arrows; and both carried a sabre, lance, and *jerid* or javelin. They were excellent irregular troops; but when European organization was introduced into the Turkish army, they were replaced (1826) by regular horse. At the present time, the French have 4 regiments of Spahis, raised from among the native tribes of Algeria, under European officers: the dress partakes very much of the Arab character, but the organization is thoroughly European. A squadron of Spahis is always maintained in garrison in Senegambia. See SEPOY: ZOUAVE.

SPAIGHT, *spāt*, RICHARD DOBBS: 1758, Mar. 25—1802, Sep. 6; b. New Berne, N. C.: legislator. He graduated at the Univ. of Glasgow; returned home and became aide to Gen. Richard Caswell 1778; was elected to the N. C. legislature 1781, 2, and 3, and to congress 1783; was a delegate to the federal constitutional convention 1787; became the first native gov. of N. C. 1792; was member of congress 1798–1801; and was a state senator at the time of his death.

SPAIN, *spān* (Sp. *España*): kingdom in Europe, occupying the larger portion of the great peninsula which forms the s.w. corner of the European continent; reaching further s. than any other European country, and further w. than any other except Portugal. It is bounded n. by the Bay of Biscay and by France, from which it is separated by the mountain ridge of the Pyrenees; e. and s. by the Mediterranean and Atlantic; w. by the Atlantic and Portugal; greatest length, from Fuenterrabia on the n. to Tarifa on the s., 560 m.; greatest breadth, from Cape Finisterre (Land's End), the extreme point on the w., to Cape Creuze, extreme point on the e., about 650 m.; average breadth about 380 m.: area—including the Balearic Isles (q.v.) and the Canary Islands (see CANARIES), and possessions in Africa—197,670 sq. m. Pop. (1877) 16,623,384; (1887) 17,650,234. The country, including the Balearic and Canary Isles, was divided 1834 into 49 modern provinces, though the former division, into 14 kingdoms, states, or provinces, is still sometimes used. The following is a table of the ancient states, and of the modern provinces into which they have been divided, with areas and populations, according to the census of 1900:

Ancient Provinces.	Modern Provinces.	Area in Eng. Sq. Miles.	Pop. in 1900.
NEW CASTILE	Madrid	3,084	775,034
	Toledo	5,919	376,814
	Gnadalajara	4,676	200,186
	Cuenca	6,636	249,696
LA MANCHA	Cuidad-Real	7,620	321,580
OLD CASTILE	Burgos	5,480	338,828
	Legrono	1,946	189,376
	Santander	2,108	276,003
	Soria	3,983	150,462
	Segovia	2,635	159,243
	Avila	3,042	200,457
	Palencia	3,256	192,472
	Valadolid	2,922	278,561
LEON	Leon	5,936	386,083
	Zamora	4,097	275,545
	Salamanca	4,829	320,765
ASTURIUS	Oviedo	4,205	627,069
GALICIA	Coruna	3,051	653,556
	Lugo	3,814	465,386
	Orense	2,694	404,311
	Pontevedra	1,695	457,262
ESTREMADURA	Badajoz	8,451	520,246
	Caeeres	7,667	362,164
ANDALUCIA	Seville	5,428	555,256
	Cadiz and Ceuta	2,834	452,659
	Huelva	3,913	260,880
	Cordova	5,299	455,859
	Jaen	5,203	474,490
	Granada	4,928	492,460
	Almeria	3,360	359,013
	Malaga	2,812	511,989
MURCIA	Murcia	4,453	577,987
	Albacete	5,737	237,877
VALENCIA	Valencia	4,150	806,556
	Alicante	2,185	470,149
	Castellon de la Plana	2,495	310,828

SPAIN AND PORTUGAL.
SCALE OF STATUTE MILES.
0 50 100 150
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SPAIN
PORTUGAL
FRANCE
ATLANTIC OCEAN
BAY OF BISCAY
MEDITERRANEAN SEA
GULF OF LYONS
BALEARIC ISLANDS
MAJORCA
IVICA
FORMENTERA
MADRID (59)
LISBON (62°)
Corunna
Ferrol
Cape Ortegal
Cape Finisterre
Santiago
Oviedo
Santander
San Sebastian
Bayonne
Bilbao
Pamplona
Burgos
Valladolid
Salamanca
Zaragoza
Barcelona
Tarragona
Valencia
Alicante
Murcia
Cartagena
Granada
Seville
Cordova
Badajoz
Toledo
Madrid
Lisbon
Oporto
Coimbra
Cape Sines
Cape S. Vincent
Cape Palos
Cape Gata
Cape Nao
Cape Creux
Gibraltar
Strait of Gibraltar
Tangier
Ceuta
Tetuan
Algiers
Oran
Melilla
MOROCCO
ALGERIA
PYRENEES MOUNTAINS
GUADARRAMA
SIERRA MORENA
SIERRA NEVADA
Andorra
Perpignan
Cape Creux
Rosas
Gerona
Barcelona
Tarragona
Vinaros
Peniscola
Castellon de la Plana
Villareal
Murviedro
Valencia
Alcira
Gandia
Denia
Cape Nao
Villajoyosa
Alicante
Orihuela
Cartagena
Palma
Ciudadela
Manacor
Cabrera Id.
Ivica
Formentera
Algiers
Tenez
Oran
Melilla
Tangier
Tetuan
Ceuta
Gibraltar
Cape Gata
Almeria
Malaga
Cadiz
Jerez
Huelva
Cape S. Vincent
C. S. Maria
Cape Espichel
Setubal Bay
Cape Sines
Lisbon
Santarem
Thomar
Leiria
C. Carvoeira
Oporto
Vianna
Caminha
Tuy
Vigo
Pontevedra
Santiago
Lugo
Coruna
Ferrol
Cape Ortegal
Cape Finisterre
Gijon
Luarca
Oviedo
Santander
San Sebastian
Bayonne
Bilbao
Pamplona
Burgos
Valladolid
Salamanca
Zaragoza
Barcelona
Tarragona
Valencia
Alicante
Murcia
Cartagena
Granada
Seville
Cordova
Badajoz
Toledo
Madrid
Lisbon
Oporto
Coimbra
Cape Sines
Cape S. Vincent
Cape Palos
Cape Gata
Cape Nao
Cape Creux
Gibraltar
Strait of Gibraltar
Tangier
Ceuta
Tetuan
Algiers
Oran
Melilla
Tenez

Ancient Provinces.	Modern Provinces.	Area in Eng. Sq. Miles.	Pop. in 1900.
Aragon	Zaragoza	6,726	421,843
	Huesca	5,848	244,867
	Teruel	5,720	246,001
Catalonia	Barcelona	2,968	1,054,541
	Tarragona	2,505	337,964
	Lerida	4,690	270,590
	Gerona	2,264	299,287
Basque Provinces	Navarre	4,055	307,669
	Biscay	836	311,361
	Guipuzcoa	728	195,850
	Alvva	1,175	96,385
N. African Settlements	.....	13	10,412
	Total	190,041	19,937,873
Islands	Balearic	1,935	311,649
	Canaries	2,807	358,564
	General total	194,783	20,608,086

By the relinquishment of Cuba and the cession of Porto Rico, the Philippine Islands and Guam to the United States in 1898, and of the remaining Ladrones, the Caroline and Pelew Islands to German in 1899, the colonies of S. were reduced.

Colonial Possessions.	Area in Eng. Square Miles.	Population.
Africa.		
Rio de Oro and Adrar	243,000	100,000
Rio Muni and Cape San Juan	900	302
Fernando Po., Annabon, Corisco, Elobey, San Juan	850	23,709
Total	252,850	124,011

Coast-line.—The entire perimeter of the country is 2,080 Eng. m.; and the coast-line, exclusive of windings, 1,317 m., of which 712 m. are on the Mediterranean, and 605 m. on the Atlantic. The n. coast, from Fuenterrabia w. to Cape Ortegal, is unbroken by any considerable indentation. A wall of rocks, varying in height from 30 to 300 ft., extends along this shore; but the water, which retains considerable depth close to the beach, is not interrupted to any unusual extent by islands or rocks. The n.w. coast, from Cape Ortegal s. to the mouth of the river Minho—which separates the Spanish province of Galicia from Portugal—though rock-bound, is less elevated and much more broken than the shores washed by the Bay of Biscay; and the indentations, the chief of which are Noya Arosa and Vigo bays, form secure and spacious harbors. From the mouth of the Guadiana, on the s., to the Strait of Gibraltar, the coast-line, though well defined, is low, sandy, and occasionally swampy. From Gibraltar to Cape Palos

the shores, backed in part by the mountain range of the Sierra Nevada, are rocky and high (with flats at intervals), are unbroken by indentations, and comprise only two harbors, Cartagena and Malaga. A low and mostly sandy coast extends n. from Cape Palos, rising into rocky cliffs and bluffs in the vicinity of Denia, but extending in sandy flats from Denia to the mouth of the Ebro. From the mouth of this river, n. to the frontier of France, the coast is alternately high and low, and its principal harbors are Barcelona and Rosas.

Surface and Hydrography.—The compactness and the isolation of this country, and its position between two seas, the most famous, and commercially the most important seas in the world, are not more in its favor than the character of its surface, which is more diversified than that of any other country in Europe of equal extent. An immense plateau, the loftiest in the continent, occupies the central regions of S.; bounded n. and w. by mountainous tracts, n.e. by the valley of the Ebro; e. by tracts of land frequently low, but in some parts traversed by hill-ranges; s. by the valley of the Guadalquivir, which intervenes between it and the Sierra Nevada (q.v.). This great plateau lies at a height of 2,000 to 3,000 ft. and covers more than 90,000 sq. m., or about half the entire area of the country. The whole of the Pyrenean peninsula is divided by Spanish geographers into seven mountain ranges, of which the chief are: 1. The Cantabrian Mountains (q.v.), and the Pyrenees (q.v.)—the most northern range; 2. The Sierra de Guadarrama, separating Leon and Old Castile from Estremadura and New Castile, and rising in the peak of Penelara 7,764 ft. above sea level; 3. The Montes de Toledo, part of the watershed between the Tagus and the Guadiana; 4. The Sierra Morena (q.v.), between the upper waters of the Guadiana and Guadalquivir; 5. The Sierra Nevada (q.v.), parallel with the shores of the Mediterranean, through s. Murcia and Andalucia, and rising in its chief summits above any other mountain-system of Europe, except the Alps. The several mountain-ridges, or as they are called, *Cordilleras* of S., have a general e. and w. direction, and between them lie the nearly parallel basins of the great rivers of the country, the Douro, Tagus, Guadiana, and Guadalquivir (see each of these titles).

Climate and Soil.—The climate, owing to the extent and configuration of the country, is exceedingly various. In the n.w. (maritime) provinces, it is damp and rainy during the greater part of the year; at Madrid about 11° s. of London, and only 5° n. of the shores of Africa, winters have occurred of such severity, that sentinels on duty have been frozen to death; while the s. and e. provinces are warm in winter, and are exposed to burning winds from the s., and to an almost tropical heat in summer. Both ancient and modern geographers have adopted difference of climate as the rule for dividing the Peninsula into tracts distinct as well in soil and vegetation as in temperature. Of these tracts or zones the first and most northern may comprise Galicia, Asturias, the Basque Provinces, Navarre, Cataloina,

and the n. districts of Old Castile and Aragon. In this tract, the winters are long, and the springs and autumns rainy, while n. and n.e. winds blow cold from the snow-covered Pyrenees. The country, which alternates with hill and dale, is plentifully watered by streams rich in fish; and meadows yielding rich pasturage abound. Grain scarcely ripens in the more exposed districts; but grain crops of all kinds are produced in others; also cider, wine, and valuable timber. The middle zone is formed mainly by the great central plateau, and comprises n. Valencia, New Castile, Leon, and Estremadura, with the s. parts of Old Castile and Aragon. The climate of the great part of this region is pleasant only in spring and autumn. Throughout the chilly winter, the treeless table-lands are swept by violent tempests, and in summer are scorched by the sun. The soil is generally fertile, and grain and wine are abundantly produced. The southern or Bætican zone, comprising the rich country between the s. wall of the central plateau and the Mediterranean shores, includes Andalucia, Murcia, and s. Valencia. The stony rampart on the n. protects it from the chilly winds of the central zone; but it is unprotected against the hot winds (the Solana: see SIMOOM) which in summer blow n. from Africa. Here the winter is temperate, and the spring and autumn delightful beyond description. The descent from the cold and mountainous central regions to this tract of tropical heat and fertility affords a striking contrast. The soil, artificially irrigated, is well adapted to agriculture and cultivation of heat-loving fruits: the products comprise sugar, cotton, and rice, and the orange, lemon, and date.

Material Revival of Spain; Population; and Distribution of Land.—Owing to a number of causes, S., at one time the most opulent kingdom in Europe, had, in the 18th c., lapsed into complete stagnation; the spirit of enterprise seemed extinct, and ease and squalor to be preferred to labor and affluence Before the commencement of the 19th c., however, the country began to throw off its lethargy; and its advance in activity has gradually accelerated. The pop. has increased, and is increasing; agriculture, previously stagnant, is now active and successful; manufactures are multiplying rapidly; and railways, of which, in the beginning of 1848, not a mile had been constructed, are now in construction between all the great centres of population—more than 4,000 m. having been complete by 1880, and more than 6,000 m. by 1889. The estimates of pop. for various periods between the beginning of the 16th c. and the middle of the 18th c. vary considerably; but it is certain that there was (1500–1700) gradual decrease of 2,000,000 to 3,000,000 of inhabitants. For later times, we have the following authentic statement:

Year.	Pop.
1768	9,159,999
1797	10,541,221
1857	15,464,340
1860	15,673,536
1870	16,835,506
1887	17,650,284
1900	18,618,086

It thus appears that in about a century the population of S. increased more than 7,000,000. The largest increase 1870–77 was in the provinces Madrid, Barcelona, Cadiz, Valencia, Jaen, Tarragona, Murcia, Avila, Valladolid, and Salamanca; 1877–87 the greatest increase was in the provinces Huelva and Biscay; and the most densely populated provinces were Barcelona, Coruña, Madrid, and Valencia. These mostly are maritime provinces, or such as have railway facilities for communication with the sea. In the provinces naturally poor or inadequately provided with means of communication, e.g., Soria, Teruel, and Almeria, the pop. was either diminishing or stationary 1887. In 1887 there were in Spain one town of 470,283 pop. (Madrid); one of 272,481 (Barcelona); three between 170,000 and 134,000 (Valencia, Seville, Malaga); three between 98,000 and 73,000 (Murcia, Zaragoza, Granada). The vast mountains, generally affording scanty herbage, are utilized for pasture in large farms. But in the warm and fertile plains, especially where water is abundant, farms are small. A few years since, it was estimated that there were about 3,426,000 farms of all sizes; of which 750,000 were occupied by tenants, the others by proprietors. More than 40 per cent of the surface of the kingdom is still uncultivated.

Origin of the People.—The Spaniards are a mixed race, and have sprung from greater variety of stocks than any other European nation. The bulk of the people is doubtless in the main from the ancient Celtiberian occupants of the peninsula: see CELTIBERI: HISPANIA. At an early time, however, there were extensive Phœnician and Carthaginian settlements in S., especially on the e. sea-board. Later, the country was penetrated with Roman elements, and was Romanized throughout, save in the Basque (q.v.) region, where the ancient speech still lives on intact. Gothic invasions left a large Germanic strain in the blood of Spain, yet plainly traceable in the n.e. hill-country. The Arab conquerors of S. planted themselves too firmly on Spanish soil to be utterly expelled; and the Moriscoes (see MOORS) are still, to the number of 60,000, easily distinguishable by their linguistic and other peculiarities. In the s. and centre, Gypsies (*Gitanos*) are numerous, and there are some Jews. One result of this commingling of races is seen in the strongly marked provincial peculiarities of Spain, extending not merely to dialectal differences, but also to physique, character, and amusements. The Castilian is the literary language of Spain; the Andalusian diverges somewhat broadly from it; in Catalonia, Valencia, and on the Balearic Isles, the prevailing dialect is closely allied to Provençal; while in the Basque Provinces the old tongue is still in universal use. Until lately (see FUERO), the Basques enjoyed quite peculiar privileges as to local govt. and administration. In spite of great local differences of character, the Spaniard generally is temperate, and his few wants are easily satisfied. He requires a daily siesta, is not very energetic by nature, loves music, dancing, and the bull-fight, and is not averse to intrigue and

GENERAL VIEW OF THE ALHAMBRA.

the use of weapons. Even amid poverty and squalor, native dignity does not forsake him. The houses generally are poorly furnished and uncomfortable, and often far from cleanly.

Religion.—Till in recent times, the Rom. Cath. faith, to which almost all the nation adheres, was the only creed tolerated by law. There are 9 archbishoprics, 51 suffragan bishoprics, and 4 unattached bishoprics. Before the suppression of the monasteries 1836, about one-fifth of the whole nation was engaged in some form of official service of the church.

Occupations of the People.—Agriculturists, laborers, miners, artisans, shepherds, and sailors constitute two-thirds of the population; one-seventh is composed of merchants and tradesmen; another seventh of officials, the army, the nobility, the clergy, nuns, beggars, and prisoners. The nobility is very numerous; the lower nobility, mostly quite poor, counting near 1,000,000 *hidalgos.* Beggars are almost as numerous, owing partly to the large number of benevolent institutions—benevolent rather than beneficent. In 1890 about 500,000 persons were maintained in 1,028 charitable institutions.

Productions, Commerce, Exports and Imports, etc.—The countries with which S. trades most are France, Great Britain, and the United States; and of these countries, France receives the great bulk of exports, with Great Britain second, and the United States third. The foreign trade is mostly through the following ports: Barcelona, Cadiz, Santander, Alicante, Malaga, Valencia, Bilbao, Cartagena, San Sebastian, Elizondo, and Irun. The principal articles imported are, in the order of their importance, raw cotton, grain and flour, coal, timber, sugar, cod-fish, wool manufactures, machinery, tobacco, iron, petroleum, hides and skins, linen, chemicals, railroad and ship-building materials, cacao, silk manufactures, and cotton goods. Chief exports are: wine, copper, iron, lead, cork, oranges, raisins, animals, wool, shoes, olive-oil esparto grass, and grapes.—Total imports (1889) $134,821,910; (1901) $164,633,500; total exports (1889) $152,532,970; (1901) $134,518,319. In 1900 the merchant navy consisted of 449 steamers and 693 sailing vessels, total tonnage 541,-964. There were about 8,300 m. of railway.

The cotton manufactures of S. have been advancing, and silk stuffs are largely fabricated; the principal cotton-factories are at Barcelona. Excellent paper is made at Telosa and Valladolid. All manufactures of tobacco, arms, and gunpowder are carried on by govt. exclusively. In 1888 a new industry was started in the provinces of Cadiz, Seville, and Malaga—the manufacture of cognac, which, taken from the rich grapes of those districts, has proved far superior to the French brand. Though neither the agriculture nor the mineral resources of Spain are properly developed, much progress has been evident of late years, chiefly in mining. Lead, copper, and tin are abundant; quicksilver is wrought; and there are large de-

posits of good coal and iron ore: the iron deposits, however, are so imperfectly worked that great quantities of iron and coal are imported from Belgium and England.

Army and Navy.—It was estimated 1897 that S. could mobilize an army of 1,083,595 men. Her standing army is 119,432. There are in S. 13 military schools and colleges. In the war with the United States, especially in battles of Cavite and Santiago, S. was stripped of her formidable navy, losing in the first named engagement 7 large vessels and in the second 6. Strength 1903: one ship rate 3, one of rate 4, 3 of rate 5, one of rate 6, one of rate 7. There are 6 destroyers and 7 torpedo boats, besides 2 cruisers building.

Revenue, Expenditure, Debt.—The outstanding national debt in 1902, March 31, was $2,023,739,176. The public revenue 1898-99 was 842,532,714 pesetas ($162,-608,874) and expenditures 878,398,568 pesetas ($169,-530,923); in 1902, 974,437,748; and 971,176,259 pesetas.

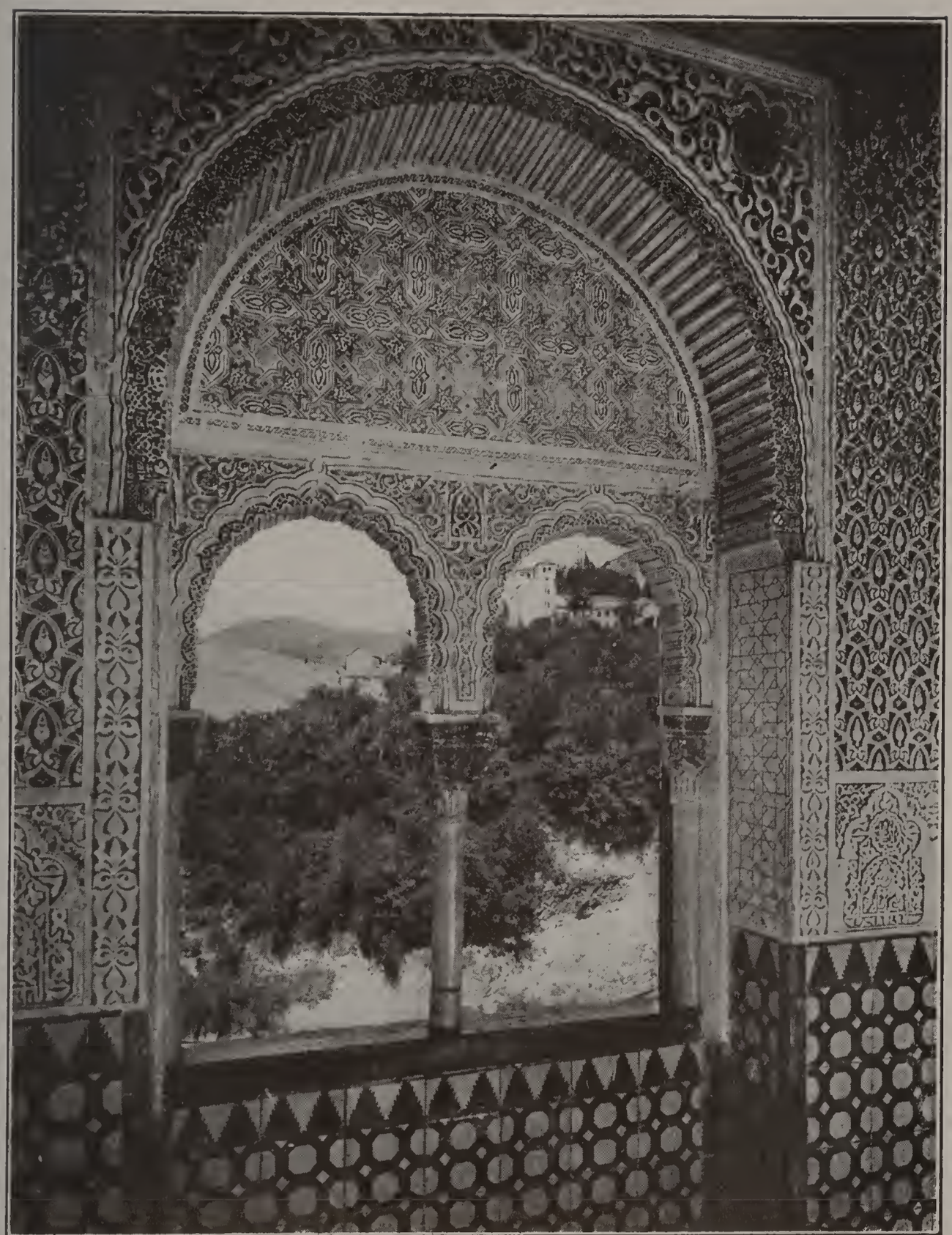
Education.—Returns show that 68 per cent. of the total population can neither read nor write; 3 per cent. can read only, and 29 per cent. can read and write. There are 10 important universities in S., attended by about 13,000 students; there are also numerous schools of art, of navigation, and mining; there are ten academies or learned societies, and a few large libraries.

History.—S., the *Spania, Hispania* (q.v.), and *Iberia* of the Greeks, and known to the Romans by the same names, was inhabited at the period when first it receives historical mention by a people deriving their origin from different races. It is supposed to have been inhabited originally by a distinct race called Iberians; upon whom, however, a host of Celts are supposed to have descended from the Pyrenees. In the earliest times of which we have any record, these two races had already coalesced and formed the mixed nation of the Celtiberians (see CELTIBERI), massed chiefly in the centre of the peninsula, in the w. districts of Lusitania, and on the n. coasts. In the Pyrenees and along the e. coast were found pure Iberian tribes, while unmixed Celtic tribes occupied the n.w. In Bætica (Andalucia) was large admixture of the Phœnician element, and on the s. and e. coasts numerous Phœnician, Carthaginian, Rhodian, and other colonies. A portion of the s. coast, called Tartessus by the Greeks, the Tarshish of Scripture, was frequented for its mineral riches by the Phœnician merchantmen, and the 'ships of Tarshish' were as distinct a section of the Tyrian mercantile marine as were the Spanish galleons of the 16th c., or the British Indiamen of more recent times. But the bond which connected the Iberians and the Phœnicians was merely commercial. About the middle of B.C. 3d c., the Carthaginian influence began to be much felt in Iberia, and a considerable territory was brought under subjection to Carthage by Hamilcar (q.v.), who founded the city of Barcelona. During the next eight years, the Carthaginian interest was

advanced, and its power further strengthened by Hasdrubal (q v.—died B.C. 220), son-in-law of Hamilcar, who founded Carthago Nova (modern Cartagena), and concluded a treaty with the Romans whereby it was stipulated that he should not advance his standards n. of the Iberus (Ebro). Hannibal (q.v.), son of Hamilcar, and greatest of all Carthaginian generals, now assumed the command in the peninsula. He attacked and destroyed Saguntum (q.v.), violating the treaty between his father and the Romans: see PUNIC (PUNICA FIDES). The destruction of Saguntum was the cause of the Second Punic War, for whose principal incidents, see CARTHAGE: ROME: HANNIBAL: SCIPIO, PUBLIUS CORNELIUS: SCIPIO ÆMILIANUS. After the Romans had driven the Carthaginians from the peninsula B.C. 206, the country was erected into a Roman province, consisting of two political divisions—*Hispania Citerior* (Hither S.), including the e. and n. districts, or those nearest the centre of the Roman empire; and *Hispania Ulterior* (Further S.), including the districts furthest from Rome, or the s. and w. districts. It was not, however, till B.C. 25 that the Cantabri and Astures, in the extreme n. of the country, laid down their arms to Augustus. After the country had been reduced to subjection, it was divided into the three provinces of Tarraconensis (embracing the n. and e. provinces), Bætica (Andalucia), and Lusitania (Portugal and some w. provinces). This division of the country lasted till the reign of Constantine the Great (q.v.) (306–337) From the time of the complete supremacy of the Romans till the death of Constantine, the condition of S. was eminently prosperous The inhabitants, when brought under the iron rule of the empire, were forced for the time to desist from the intestine wars in which it had been their habit to indulge; and adopting the language, laws, and manners of their conquerors, they applied themselves to industrial pursuits, and increased remarkably both in wealth and in numbers. Everywhere throughout the country, towns purely Roman sprang up, chief among which were Leon, Emerita Augusta (Merida), Pax Julia (Beja), Cæsaraugusta (Zaragoza); and numerous aqueducts, bridges, amphitheatres, etc., were built, whose ruins are the wonder of the modern traveller. S., though obtained at enormous cost both in treasure and in human life, was for three centuries the richest province of the Roman empire. Its fertile fields formed for a considerable time the granary of Rome; and from its metal-veined sierras an immense treasure in gold, silver, etc., flowed into the Roman coffers. 'Twenty thousand pound-weight of gold,' says Gibbon, 'was annually received from the provinces of Austria (Asturias), Galicia, and Lusitania.' This wealth was not the voluntary offering of the natives, who were compelled to labor in their mines for the benefit of strangers; thus S., in the early ages, was the type of Spanish America in the 15th and succeeding centuries, with the single difference that in the first case the Spaniards were the slaves, and in the second the slave-holders. A.D. 409 hordes of barbarians, Alans, Vandals, and Suevi,

crossed the Pyrenees and swept over and desolated the peninsula—the Vandals mostly settling in Bætica, the Alans in Lusitania (Portugal), and the Suevi in Leon and Castile. About 412 the Visigoths invaded the country, and their king, Athaulf, who acknowledged a nominal dependence on the Roman emperor, established the Gothic monarchy in Catalonia: see GOTHS. Of the Visigoths—by whom the Suevi were subjugated (584), and by whom the Vandals and Alans were expelled (427) from the country, and large portions of Gaul annexed to their Spanish dominion—the most remarkable kings were Wallia (reigned 415–418), who greatly extended the Gothic monarchy; Euric (reigned 466–483), who, besides increasing his territory, introduced and enforced a body of laws, and did much for advancement of civilization in S.; Wamba (reigned 673–680), who built a fleet for protection of the coasts; and Roderick (q.v.), killed at Xeres de la Frontera 711, in battle with the Moors. The battle of Xeres gave the Moors almost undisputed mastery of nearly the whole of S., as well as of the outlying Gothic province of Septimania (Languedoc) in France; for the remnant of the Goths betook themselves to the highlands of Asturias, Burgos, and Biscay, where, in a region which throughout had enjoyed more liberty than any other part of S., they maintained their independence.

Dynasty of the Moors.—The Arabs, more properly termed the Moors (q.v.), held S. for the first few years of their rule, as a dependency of their province of n. Africa; but after the downfall of Muza (q.v.), and of his son Abd-el-aziz, who had been the deputy-gov. of Spain, the country was governed (717) by *emirs* appointed by the caliph of Damascus. The favorite scheme pursued by the Spanish emirs was the extension of their conquests into Gaul, to the neglect of the rising power of the Goths in Asturias; they took also the Balearic Isles, Sardinia, Corsica, and part of Apulia and Calabria; the Mediterranean was infested by their fleets, but their northward progress was most signally checked on the plain of Tours by Charles Martel (q.v.). Anarchy and bloodshed were prominent features of the first 40 years of Mohammedan rule in Spain. The *walis*, or local governors of districts and provinces, frequently rebelled against the emir, and drew sword against each other according as ambition or animosity dictated. Within this period of 40 years, no fewer than 20 emirs had been called to the direction of affairs; but a revolution at Damascus, which unseated the Ommiades (see OMMIADES—O. OF SPAIN), and placed the Abbasides in possession of the caliphate, ended this misrule in S. The last of the *emirs*, Jussuf, was in favor of the Abbasides, but the *walis* and *alcaydes*, being chiefly of the Ommiade faction, invited one of this family, who was in concealment among the Zeneta Arabs in Barbary, to become an independent caliph in Spain: see OMMIADES. Thus was founded the *caliphate of Cordova*, from which, 778, the Franks wrested all its possessions n. of the Pyrenees, and northeastern S. to the Ebro; the latter acquisition, subsequently denominated the *Spanish March*,



VIEW OF THE MOSQUE, FROM THE ALHAMBRA.

being alternately in the hands of the Moors or dependent on France.

Christian Kingdoms.—During this period of Moorish domination, the small independent kingdom of Asturias, founded by Pelayo (q.v.), had been growing in power and extent. It was increased by Galicia 758, and by parts of Leon and Castile toward the close of the century. In 758, a second independent Christian kingdom was founded in in Sobrarve, and increased by portions of Navarre on one hand and Aragon on the other; but though it with the French Gascons, aided the Moors at Roncesvalles (q.v.), it was, 801, again swallowed up by the caliphate of Cordova. However, 36 years later a Navarrese count, casting off his allegiance to France, founded the third Christian kingdom, that of Navarre (q.v.), which from this time easily maintained itself, owing to its situation, in independence of the Moors. The kingdom of Asturias, now (900) Leon, was for a long time distracted by bitter and bloody strife among the members of the royal line, and with its neighbor Navarre would have fallen an easy prey to the powerful Ommiades, had not the latter directed their chief attention to the subjugation of Morocco; and under cover of this relaxation of the constant warfare between Moors and Christians, another independent monarchy, an offshoot from Leon, was founded in Castile (933, kingdom in 1035), which, from its central position, and consequent greater facilities for expansion, soon became the most powerful of the Spanish states, especially after its union (temporary, 1072–1157) in 1230 with Leon. A considerable part of Aragon had been wrested from the Moors by Sancho III. (1000–35) of Navarre, and at his death this part of his dominions passed by inheritance to his son Ramiro, who added to it the districts Sobrarve and Ribagorza, and a considerable territory which he conquered from the common enemy, the Moors. This kingdom of Aragon was the last Christian kingdom formed in S.; and though it increased, by acquisitions from the Moors, yet being limited by Leon, Castile, and Navarre on one side, and the Spanish March (now only the county of Catalonia or Barcelona) on the other, its princes aimed at maritime power; and by the union, through the marriage of the Count of Barcelona with Queen Petronilla, of the Spanish March with Aragon, means were obtained of carrying out this policy; and the spread of the Aragonese dominion to Sicily (q.v.), Naples (q.v.), and other regions bordering on the Mediterranean, was the consequence. These three kingdoms—Castile and Leon, Navarre, and Aragon—continued, sometimes in combination and sometimes separately, to war against their common enemy, the Moors—Castile being, from its greater power and proximity, the most persistent assailant; and Navarre, for the opposite reason, the least so; but whenever the arrival of fresh levies from Africa, or the accession of an energetic caliph threatened serious danger to any one of the three, the others generally came to its aid.

The extinction of the Ommiades in Spain 1031, and the

disruption of the caliphate into the minor kingdoms Cordova, Seville, Toledo, Lisbon, Zaragoza, Tortosa, Valencia, Murcia, Badajos, and seven others of less note, was an occurrence by which the kings of Castile and Aragon did not fail to benefit; for by well-directed and unremitting attacks they subdued some, rendered others tributary—the kings of Portugal also on their side gallantly and successfully pursuing the same policy; and a few years more would have certainly annihilated Moorish domination in S., had not Mohammed of Cordova and Seville, hard pressed by Alfonso VI. of Leon and Castile about the close of the 11th c., applied for aid to an Arab tribe, whose military career in n. Africa had been most brilliant. This tribe, the Almoravides (q.v.).—i.e., men devoted to the service of God—had made themselves masters of the provinces of Africa and Almagreb, and founded the empire of Morocco. Responding to the request of Mohammed of Cordova and Seville, the Almoravides crossed over to S.; defeated the king of Aragon and Castile, and recovered much of New Castile. Then turning on their ally Mohammed, they compelled him to yield up the provinces of Cordova and Seville, and all the minor Moorish princes to follow his example; so that 1094, the Almoravide sovereign was acknowledged sole monarch of Mohammedan Spain. The power of this tribe, however, began to decline about 1130 and was extinguished by the Almohades (q.v.), a fanatical sect of Mohammedans, who landed in S. in the middle of the 12th c., and conquered the territories of the Mohammedans in Spain. During the reign of the third monarch of this dynasty took place the battle between the combined forces of Castile, Leon, Navarre, Aragon, and Portugal, with the Moors, in which the former gained the most celebrated victory ever obtained by the Christians over their Moslem foes—the latter losing, according to the account transmitted to the pope, 100,000 killed and 50,000 prisoners. This sanguinary conflict on the plains of Tolosa (*las navas de Tolosa*), 1212, July 16, broke the Almohade power in Spain, as that of Salamanca 1812, July 22, almost exactly six centuries afterward, broke the more formidable strength of Napoleon. On the fall of the Almohades, Mohammed-ben-Alhamar, King of Jaen, rose to the first place among the Mohammedan princes, and founded (1238) the *kingdom of Granada*. The king of Gradada was speedily forced to become a vassal of Castile, and from this period all danger from Moslem power was over. The rest of the history of the Spanish kingdoms before their union, calls for no detailed account, The Castilian court was the scene of almost constant domestic strifes and rebellions, varied with a campaign against Granada or in favor of the monarch of that kingdom against his rebellous vassals; the only prominent monarchs of this kingdom being Ferdinand III., who confined the Moorish dominion s. of Andalucia, Alfonso X. (q.v.), Alfonso XI., Pedro the Cruel (q.v.), and Queen Isabella, last sovereign of Castile (see ISABELLA, of Castile), who succeeded her brother Henry IV., owing to a wide-spread belief in the illegitimacy of Henry's daugh-

ter Aragon, on the other hand, was almost wholly free from intestine dissensions, doubtless because of the interest taken by the Aragonese monarchs in Italian politics; of these sovereigns Jayme I. (reigned 1213–48) conquered Valencia and Majorca, and, first of all the Aragonese kings, received a voluntary oath of allegiance from his subjects; Pedro III. (reigned 1248–85) who obtained Sicily (1282), Minorca, and Iviza; Jayme II., who conquered Sardinia and Corsica; Alfonso V. (reigned 1416–68), who conquered Naples; and Ferdinand II. (q.v.), the Catholic, last sovereign of Aragon, who, by marriage with Isabella, Queen of Castile (q.v.), 1469, the conquest of Granada 1492, and that of Navarre 1512, united the whole of Spain and French Navarre, under one rule.

The year 1492, in the reign of Ferdinand and Isabella witnessed also the discovery of America, as well as the capture of Granada. S. had now become consolidated into one empire, from the Pyrenees to the Strait of Gibraltar; civil wars were at an end; and a splendid continent, teeming with riches, had been opened up for Spanish adventure and enterprise. But, as the most active spirits among the Spaniards now crowded to the new world, the soil of S., and its mineral treasures, both inexhaustible sources of wealth, were neglected for the riches of the fancied El Dorado, where, as was everywhere believed, gold was more plentiful than iron was in the old country. Besides the drain on the country from emigration, the expulsion of the Jews and Moors was productive of direst results; and the decline of the splendid Spanish Empire, on which the sun even then never set, may be said to have had its origin in the event which raised the country to the height of its magnificence. Charles I. (Charles V. of Germany, q.v.) succeeded Ferdinand on the Spanish throne; and in his reign Mexico (q.v.) and Peru (q.v.) were added to the possessions of Spain.

Philip II. (q.v.), by his enormous war expenditure and mal-administration, laid a foundation for the decline of the country. Industry, commerce, and agriculture may be said to have been extinguished at the expulsion of the Moriscoes (see MOORS); and the reigns of Philip III. and Philip IV. witnessed a fearful acceleration in the decline of S. by the contests with the Dutch, and with the German Protestants in the Thirty Years' War, the intermeddling of Olivarez (q.v.) in the affairs of n. Italy, the rebellion of the Catalans, whom the minister wished to deprive of their liberties the wars with France, and the rebellion of Portugal (1640), which had been united to S. by Philip II. The reign of Charles II. was still more unfortunate, and his death was the occasion of the War of the Spanish Succession (see SUCCESSION WARS). Philip V. (q.v.) was the first of the Bourbon dynasty who occupied the throne of Spain. Under Charles III. (reigned 1759–88), a wise, enterprising, and enlightened prince, the second great revival of the country commenced; trade and commerce began to show returning activity, and population increased. During the inglorious reign of Charles IV. (reigned 1788–1808), who

left the management of affairs in the hands of the incapable Godoy (see ALCUDIA), a war (1796-1802) broke out with Britain, which was productive of nothing but disaster to the Spaniards; and by the pressure of the French another war arose 1804, with similar ill success. Charles abdicated in favor of his eldest son, the Prince of Asturias, who ascended the throne as Ferdinand VII. Forced by Napoleon to resign all claims to the Spanish crown, Ferdinand became a prisoner of theFrench in the year of his accession, and in the same year Joseph, brother of the French emperor, was declared king of S. and the Indies, and set out for Madrid, to assume the kingdom thus assigned to him. But before this time, an armed resistance had been organized throughout the country. The various provinces elected juntas or councils, consisting of the most eminent inhabitants of the respective neighborhoods, and it was the business of these juntas to administer the government, raise troops, appoint officers, etc. The supreme junta, that of Seville, declared war against Napoleon and France, 1808, June 6. In July, England, on solicitation, made peace with S., recognized Ferdinand VII. as king, and sent an army to aid the Spanish insurrection. Joseph, July 9, entered S., defeated (through his lieut. Bessières) the Spaniards at Rio Seco, and entered Madrid on the 20th; but the defeat of Dupont at Baylen by the veteran Spanish gen. Castaños, altered the position of affairs; and Joseph, after a residence of ten days in his capital, was compelled to evacuate it, and retire to Vitoria. The noble defense by Palafox of the city of Zaragoza against Lefebvre, and the return of the Marquis de la Romana with 7,000 regular troops who had been wiled from the country by Napoleon, did much to inspirit the patriots. 1808, July 12, Sir Arthur Wellesley, afterward Duke of Wellington (q.v.), at the head of the British auxiliary force, landed (Aug. 5) at Mondego Bay, and began the Peninsular War by defeating the French at Roliza and Vimiero (q.v.); but in spite of his opposition, the Convention of Cintra was signed, and the French transported to their own country. 1808, Nov. Napoleon, who had been preceded by Ney (q.v.) with 100,000 men, entered S., and at once assumed the command. For a time his armies were completely successful; Soult utterly routed the Spanish gen. Belvedere, Nov. 10, and annihilated Blake at Reynosa on the 13th. Castaños and Palafox were routed at Tudela by Lannes, and in the beginning of Dec., Napoleon entered Madrid. At this time, the British forces were under the command of the gallant Sir John Moore (q.v.), who, aware of his great inferiority in numbers and resources, retreated w. from Salamanca, whither he had come to assume command of the allied forces, and reached Coruña (q.v.) 1809, Jan. 11. On Apr. 22, Gen. Wellesley (see WELLINGTON, DUKE OF) arrived in Portugal; and, at once commencing operations, drove Soult from Oporto, and took possession of Portugal; then, favored by the disunity of action which subsisted between the three or four French armies who held S., he directed his attacks on the army of the centre, retreating when any

of the others came to its aid, and by dint of mastery generalship and bold enterprise, succeeded, after four campaigns, in driving the French from the country. In 1812 a constitution, on the whole liberal, had been devised for the country by the cortes of Cadiz. It was abrogated, however, by Ferdinand VII., who treated with infamous ingratitude the subjects who had shown such devoted loyalty to him, and obtained the aid of France to establish despotism. The reign of his daughter, Isabella II., was disturbed by the Carlist rebellion 1834-39, in which the British aided the queen with an army under Sir De Lacy Evans: see CARLOS. The next event of importance was the contest between Espartero (q.v.) the regent, and the queen-dowager Christina, for the supreme power during the minority of the queen. Espartero was successful 1840-43, but was compelled to flee before O'Donnell and Narvaez, and was not restored till 1847. The constituent cortes of 1837 drew up a new constitution, based on that of Cadiz. In 1845 another constitution was promulgated by Narvaez, Duke of Valencia. Frequent changes of ministry, occasional revolts, the banishment of Queen Christina (1854), the formation of the O'Donnell ministry (1858), the war with the Moors (see MOROCCO), the annexation of San Domingo (1861), and the quarrels between Spain and her former colonies, Peru (1864-5) and Chili (1865), were the most marked events in the more recent history of Spain prior to 1868. In 1868 Isabella was driven from the throne by a general revolt; and the cortes, 1870, November, elected Prince Amadeo of Italy to be king. Amadeo abdicated early in 1873, when the form of government was changed to a republic. During the remainder of 1873 and the whole of 1874, Spain was the scene of anarchy and bloodshed resulting from the mutual opposition of the Carlists and republicans. 1874, Dec. 30, the son of the ex-queen Isabella was declared king of Spain as Alfonso XII. Born in 1857, he died 1885, Nov. 25, leaving two daughters, one of whom, Maria de las Mercedes, succeeded him, under the regency of the queen, till 1886, May 17; when a son, Alfonso XIII. (q.v.), was born, who succeeded his sister by right of birth; and the regency was extended to cover his minority. The inhuman treatment of the citizens of Cuba by the Spanish authorities, 1896-98, and the destruction of an American battleship in Havana harbor while on a friendly visit, brought about war between Spain and the United States (see SPANISH-AMERICAN WAR), 1898, April 21, which ended by the Treaty of Paris signed 1898, Dec. 10, and the cession of Porto Rico and the Philippines to the United States and the surrendering of the Spanish sovereignty over the island of Cuba. Alfonso XIII. was crowned May 17, 1902.

SPAKE, v. *spāk*: did speak, pt. of speak, but now nearly obsolete: see SPEAK.

SPALATO, *spâ-lâ'tō,* or SPALA'TRO, *-trō* (in Illyric, SPLIT): important seaport of Dalmatia, empire of Austria; finely situated on a promontory on the e. coast of the Adriatic. It originated in the famous palace of Diocletian, built in the 3d c. This immense structure (12 years in building) stood not far from the city of Salonæ, the great bulwark of Roman power in Dalmatia; and when Salonæ was conquered by the Avars in the 7th c. the inhabitants fled for refuge to this fortress-palace, where they laid the foundations of a new town, named *Aspalathum, Spalathon, Spalathron,* or *Spalatrum,* whence the modern *Spalato.* Even yet, more than one-half of the town is compressed within the limits of the ancient palace, a considerable portion of whose walls remain. The best-preserved parts of the palace are the temple of Jupiter, transformed in the 7th c. into a Christian cathedral; and the temple of Æsculapius, which is now a baptistery dedicated to St. John. Of special interest are the ruins of an aqueduct constructed of massive hewn stones. Modern Spalato is divided into an old and a new town: the former consisting mainly of narrow, crooked, and dirty lanes; the latter more agreeable and open. It is the seat of a bishop, has a chamber of commerce and manufactures, and is the principal emporium for goods passing from Italy overland into Turkey. Pop. 15,000.

SPA'LAX. See MOLE-RAT.

SPALDING, *spawl'dĭng:* important market-town and river-port in Lincolnshire, England; on the Welland, 8 m. from its mouth in the Wash. Considerable trade is carried on by the Welland, and vessels of 100 tons can reach the town. An important stock and corn market is held every Tuesday. Spalding was a place of consequence as early as the Saxon times, and contained a Benedictine monastery. Pop. (1901) 9,385.

SPALDING, *spawl'dĭng,* MARTIN JOHN: Roman Catholic prelate: 1810, May 23—1872, Feb. 7; b. Marion co., Ky. Having completed his classical studies and studied theology in seminaries in Kentucky, he went to Rome and entered the Propaganda College. Ordained priest 1834, he returned to Kentucky, and was successively professor of philosophy in St. Joseph's College, Bardstown; president of that college, and vicar-general of the diocese of Louisville, till 1848, when he became coadjutor bishop and soon after titular bishop of Louisville. In the meantime he had established the *Catholic Advocate,* a powerful organ of Roman Catholic opinion. He was much esteemed as a public lecturer and preacher, and for philanthropic effort. His contributions to Roman Catholic biographical, historical, and theological and polemic literature were numerous and important. He was made archbishop of Baltimore 1864. In the Vatican Council of 1869-70 he was at first an 'inopportunist,'

but then faced about and became the zealous champion of papal infallibility.

SPAL'DING, SOLOMON: 1761-1816; b. Ashford, Conn.: author. He served in the revolutionary army; graduated at Dartmouth College 1785; was ordained a Congregational minister 1787; and after preaching three or four years engaged in mercantile business and literary work. While living in Conneaut, O. (1810-12), he wrote a romance based on the idea that the American Indians were descended from the lost tribes of Israel, entitled *The Manuscript Found.* It is claimed that this MS. was copied by Sidney Rigdon in the Pittsburgh printing-house, to which it was sent for publication, and that after the death of Spalding this copy was made the original of *The Book of Mormon.* This the Mormons (q.v.) vigorously deny.

SPALE, or SPAIL, n. *spāl* [Dut. *spelle,* a splinter: Icel. *spjall,* a lath, a thin board: AS. *speld,* a chip for lighting: Gael. *spealt,* a splinter; *spealt,* to cleave]: in *Scot.,* a lath; a chip; a shaving of wood.

SPALL, n. *spawl:* in *masonry,* a chip of stone removed by the hammer: V. to reduce irregular blocks of stone to an approximately level surface: in *mining,* to break, as ore, with a hammer, previous to cobbing.

SPALL, or SPALLE, n. *spawl* [OF. *espaule;* It. *spalla;* F. *épaule,* a shoulder—from mid. L. *spat'ŭla,* the shoulderblade—from L. *spatha,* a flat wooden instrument (see SPADE)]: in *OE.,* the shoulder.

SPALLANZANI, *spâl-lân-dzâ'nē,* LAZARO: 1729, Jan. 12—1799, Feb. 12; b. Scandiano in Modena, Italy: naturalist and anatomist. After a careful education, he took clerical orders; and 1754 was appointed to the chair of logic, metaphysics, and Greek at Reggio; but soon after this he obtained a chair at Modena, and refusing offers by the Universities of Parma and Coimbra, and the Academy of St. Petersburg, applied himself to study of natural history. His attention was directed to the doctrine of generation propounded by Needham and Buffon; which, after careful study and experiment, he overturned. He then studied the circulation of the blood, and was the first to follow its course through the intestinal tube, the liver, spleen, ventricles, pulmonary organs, etc.; 'established,' according to Senebier, 'the propulsive power of the heart over the blood in the various vessels, demonstrated that the heart never wholly empties itself, explained the various causes which retard the circulation, and the obstacles produced by the weight of the blood.' On the re-establishment of the University of Pavia, Spallanzani was appointed (1768) professor of natural history, and keeper of the museum, which he greatly enriched with fishes, crustacea, and testacea, results of his numerous excursions. In 1785, refusing the chair of natural history at Padua, admirably filled by Vallisnieri, he accepted the proposal of Archduke Ferdi-

nand to accompany, with doubled salary, the Austrian ambassador to Constantinople. He visited Naples while Vesuvius was in eruption, 1788; also the Lipari Isles and Sicily—in restless prosecution of his scientific labors and then retired to Pavia, where he spent the remainder of his life, in scientific researches, amid bodily sufferings, and died of apoplexy. His works, many of the more valuable translated into English, are too numerous to mention; a complete list, with biography, is in *Biographie Médicale,* VII. See also, for the result of his labors, the *Eloge,* by Alibert, in *Mémoires de la Société Médicale d'Emulation.*

SPALPEEN, n. *spăl'pēn* [Ir. *spailpin;* Gael. *spailpean,* a mean, conceited fellow—from Ir. and Gael. *spailp,* pride]: in *Ireland,* a mean fellow; a rascal.

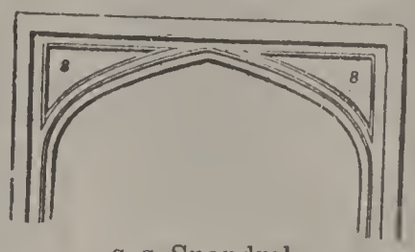
SPAN, n. *spăn* [Ger. *spanne;* It. *spanna;* Icel. *spönn;* Dan. *spand,* a span: AS. *spannan,* to bind: Dan. *spænde,* to span: Dut. *spannen,* to stretch, to span]: natural measure of length, the distance between the tips of the thumb and of the little finger when extended as far as possible with the average hand—usually reckoned 9 in.: the spread of an arch; short duration; a yoke of oxen: V. to measure by the hand with the fingers extended, or by encompassing the object; to spread from one side to another, as an arch; to fetter, as a horse. SPAN'NING, imp. SPANNED, pp. *spănd.* SPAN'NER, n. *-nėr,* one who or that which spans. SPAN-COUNTER, n. *spăn-kown'tėr,* in *OE.,* a game at which money was thrown within a span or mark. SPAN-ROOF, in *arch.,* a common roof having two inclined planes.

SPAN, v. *spăn:* pt. of SPIN, which see.

SPANÆMIA, n. *spă-nē'mĭ-ă* [Gr. *spanis,* scarceness; *haima,* blood]: a diseased condition of the blood, characterized by a deficiency in its red corpuscles. SPANÆMIC, a. *spă-nē'mĭk,* having the property of impoverishing the blood; having an impoverished or thin state of blood.

SPANDAU, *spân'dow:* town in Prussia, province of Brandenburg, at confluence of the Havel and the Spree, 8 m. n.w. of Berlin; on the Berlin and Hamburg and the Berlin and Lehrte railroads. It is strongly fortified and is the key of the defenses of Berlin; the garrison numbers 4,000 men. In the citadel is kept the imperial war-treasure of about $30,000,000 gold. All the works are surrounded by water, and nearly all the lands around the city can be flooded. Spandau is a great depot for war-material, and has numerous factories and laboratories for manufacturing cannon, small-arms, gunpowder, fixed ammunition, etc.; in these establishments 4,000 workmen are constantly employed. The civil industries of the town are unimportant. Spandau is one of the oldest towns in Prussia, having received town rights 1232. Pop. (1900) 65,030.

SPAN'DREL: triangular space between the outside of



s, s, Spandrels.

an arch and a square head including it. This space is often filled with sculptured foliage, figures, etc.

SPANG, n. *spăng* [for SPANGLE, which see]: in *OE.*, a very thin piece of gold or other shining material; a spangled ornament: V. in *OE.*, to adorn with spangles.

SPANGENBURG, *spăng'gen-bĕrg*, Ger. *spăng'en-bĕrch*, AUGUSTUS GOTTLIEB, PH.D.: 1704, July 15—1792, Sep. 18; b. Klettenberg, Hanover: Moravian bp. He entered the Univ. of Jena 1722; studied law, then theol.; became asst. prof., and prof., but was dismissed on account of his sympathy with Count Zinzendorf, with whom he became associated 1727. In 1735 he founded a Moravian colony at Savannah, Ga., and afterward preached in Penn. He was made bp. of the Amer. Moravian churches in 1744 (or 1747), and resided at Bethlehem, Penn., 1744–61—an outpost where his influence with the Indians was much valued by the govt. He was adopted by the Iroquois on a visit to Onondaga. In 1752 he helped survey a large area in N. C. for settlement. He died in Saxony. He was indefatigable, personally winning, and has been called the Melanchthon of the Moravians. He published *Idea Fidei Fraternum* (1782), translated under the title *Exposition of Christian Doctrine;* also, *Life of Count Zinzendorf.* Some of his hymns are famous, such as *Die Kirche Christi, die Er geweiht* (The church of Christ, that he has hallowed), and *Heil'ge Einfalt,* etc. (Holy Simplicity—translated 'When simplicity we cherish,' etc.). An Eng. translation of Ledderhose's life of S. was pub. 1855.

SPANGLE, n. *spăng'gl* [Ger. *spange,* a brooch, ornament: Gael. *spang,* anything shining or sparkling: Bav. *spangeln,* to sparkle: Dut. *spang;* Icel. *spöng,* a clasp, a plate of metal]: small circular plate or scale of very thin shining metal, usually silvered or gilded tin, pierced with a needle-hole so that it can be sewed upon cloth—used chiefly for decorating theatrical costume; any little thing sparkling and glittering: V. to adorn with spangles; to glitter. SPANG'LING, imp. SPANG'LED, pp. *-ld:* ADJ. adorned or beset with spangles. SPANG'LY, a. *-lĭ,* glittering; glistening.

SPANIARD, n. *spăn'yerd:* native of Spain (q.v.). SPAN'ISH, a. *-ĭsh,* of or from Spain: N. the language of Spain. SPANISH-FLY, a winged beetle, collected in large quantities, and used for raising blisters; cantharides (see CANTHARIS). SPANISH-JUICE, licorice. SPANISH FERRETO, *fĕr-rē'tō,* a rich reddish-brown color obtained by calcining copper and sulphur together.

SPANIEL, n. *spăn'yĕl* [F. *épagneul;* OF. *espagneul,* a spaniel—from Sp. *español,* Spanish: Sp. *España;* L. *Hispania,* Spain]: *literally,* a Spanish dog; sporting-dog remarkable for sagacity and fawning: hence, a mean cringing person.—The Spaniel is of many breeds, which differ considerably in size and other characters. All are characterized by large pendulous ears, long silky hair, often curly and shaggy, and acute scent. None are large; some are among the smallest of dogs. All are lively, playful,

Spaniel.

docile, and affectionate in a high degree. The S. is ever petitioning for regard, and shows boundless joy on receiving kind attention. The ENGLISH or SUSSEX S. is of elegant but moderately stout form; with very large pendent ears, of which the hair is very long; muzzle rather broad; tail bushy, body covered with long silky hair; colors various, very often liver-colored and white, or red and white. In the days of falconry, spaniels were much used for starting the game. The Cocker (q.v.), the Springer (q.v.), and the Blenheim Dog (q.v.) are different kinds of spaniels. —The KING CHARLES'S S. is a beautiful black-and-tan breed, almost as small as the Blenheim dog, and is named from Charles II., who delighted in dogs of this kind.—The WATER S. is one of the larger breeds. It has comparatively hard hair, and is distinguished by its readiness to pursue game by swimming: it is much used in decoy-ponds to drive ducks into the net.

SPANISH-AMERICAN WAR, 1898, April 21—Aug. 12, was due to Spain's inability to subdue the state of insurrection which existed in the island of Cuba from 1895, and her refusal to grant the colony its absolute freedom. The popular sentiment of the United States favored the Cuban insurgents who were waging a war for independence with a small army and scarcely any munitions of war. Notwithstanding the vast superiority, both in number and equipment, of the Spanish troops over their antagonists, the Spanish captains-general found the subjugation of the revolted Cubans a hopeless and impossible task. The humane Marshal Campos, who, as Captain-General at the outbreak of the insurrection, strove to terminate it by pacific measures, was quickly recalled by the home government for lack of energy, and in 1896, Jan., was

succeeded by Gen. Valeriano Weyler, who immediately inaugurated a policy of fire and sword wherever his troops could penetrate. By adopting this policy he hoped to starve the revolted Cubans into submission, but the only result was the herding together of all the inhabitants of the outlying districts around fixed military zones, after having burnt their dwellings and destroyed their property, and having little or no food to give them, they died by thousands of starvation and disease. Although Gen. Weyler had undertaken to end the insurrection in a few months, he succeeded in occupying only certain restricted portions of the island and reconcentrating the starving Cubans. The condition of the natives caused widespread indignation throughout the United States and led to a strong diplomatic remonstrance, the ultimate result of which was the recall of Weyler and the promise of a more humane policy toward the "reconcentrados," as the penniless inhabitants huddled together to starve at the military posts were called. Marshal Ramon Blanco, who had been Governor of the Philippines, was appointed to succeed Weyler, and set about to institute a form of autonomous government. But the reforms were not acceptable; the Cubans wanted nothing short of that independence for which they had fought so stubbornly.

In 1896, Feb., Congress took official cognizance of the state of affairs in Cuba, and after a protracted debate resolved (April 6) to grant the Cubans recognition as belligerents, and offered the friendly offices of the United States for the recognition by Spain of the independence of Cuba. Although when he took office Blanco issued a proclamation of amnesty, the insurgents disregarded it, and fighting continued.

The year 1898 opened with the war unsuppressed, and the irritation in the United States over the killing by starvation of hundreds of "reconcentrados" increased. Its effect intensified the feeling of the Spaniards against America, and the volunteers and rougher element openly demonstrated their animosity. The life of the consul-general at Havana was threatened, and, so that American interests and human life might be adequately protected, President McKinley ordered a war vessel to Havana harbor, ostensibly on a friendly visit, but no doubt as a protective step. The request of the Spanish Government for the recall of Consul-General Lee, which was refused, and the publication of a letter containing insulting references to the President, written by the Spanish Minister, Señor De Lome, increased the tension, which was further intensified by the destruction in Havana harbor, Feb. 15, of the battleship *Maine* and 266 of her crew.

This awful calamity was generally regarded by the American people as an act of treachery, and soon after the war spirit arose. By the time the verdict of the Court of Inquiry appointed to investigate the destruction of the *Maine* had been published, Congress had passed unanimously a bill to appropriate $50,000,000 for national defense. By April 10 all American consuls had been

recalled, and on the 18th the following resolution was passed by Congress:

"Whereas, The abhorrent conditions which have existed for more than three years in the island of Cuba, so near our own borders, have shocked the moral sense of the people of the United States, have been a disgrace to Christian civilization, culminating as they have in the destruction of a United States battleship with 266 of its officers and crew, while on a friendly visit in the harbor of Havana, and cannot longer be endured, as has been set forth by the President of the United States in his message to Congress of April 11, 1898, upon which the action of Congress was invited; therefore,

"Resolved, By the Senate and House of Representatives of the United States of America, in Congress assembled:

"First—That the people of the Island of Cuba are, and of right ought to be, free and independent.

"Second—That it is the duty of the United States to demand, and the Government of the United States does hereby demand, that the Government of Spain at once relinquish its authority and government in the island of Cuba, and withdraw its land and naval forces from Cuba and Cuban waters.

"Third—That the President of the United States be, and he hereby is, directed and empowered to use the entire land and naval forces of the United States, and to call into the actual service of the United States the militia of the several States, to such extent as may be necessary to carry these resolutions into effect.

"Fourth—That the United States hereby disclaims any disposition or intention to exercise sovereignty, jurisdiction, or control over said island, except for the pacification thereof, and asserts its determination when that is completed to leave the government and control of the island to its people."

It was signed by the President April 20, and a copy was served on the Spanish minister, Polo y Bernabé, who asked for his passports and left Washington. On the 21st the Spanish authorities at Madrid sent the American minister, Gen. Woodford, his passports, which act practically constituted a declaration of war. Congress immedately passed an act to increase the naval and military strength, and the President notified the neutral powers of the war. Great Britain formally notified Spain that coal would be considered contraband of war, and on the 22d the American fleet sailed from Key West to blockade the Cuban ports. The President issued a call for 125,000 volunteers April 23, and two days later Congress passed an act declaring that war had existed between Spain and the United States since April 21. Great Britain issued a proclamation of neutrality April 24, and was followed by the powers, with the exception of Germany, a few days later.

The first prize of the war, the *Buena Ventura*, a Spanish ship, was captured by the U. S. gunboat *Nashville*, April 22. On the 27th the batteries of Matanzas were shelled, and Cienfuegos and Cardenas were attacked a few days

later and the cables cut. In the meantime the Asiatic squadron, under Commodore Dewey, had captured Cavité and destroyed the Spanish Pacific fleet, May 1. (See DEWEY, GEORGE.) Eleven days later San Juan de Porto Rico (q.v.) was bombarded by Admiral Sampson, and a flying squadron was organized to discover the whereabouts of Admiral Cervera and the Spanish Atlantic fleet. Having eluded the American ships, Cervera reached Santiago May 19, and on the 30th was found there by Admiral Sampson, who immediately shelled the forts commanding the harbor.

To make it impossible for the Spanish fleet to escape, Lieutenant Hobson, under orders from Admiral Sampson, sank the American collier *Merrimac* at the entrance of Santiago harbor June 3, but was taken prisoner. The Spanish cruiser *Reina Mercedes* was sunk by the blockading fleet off Santiago harbor June 6, and a few days later marines from the fleet were landed at Guantanamo (11th). They skirmished with the enemy the following day, when reinforcements set sail from Key West. The fighting between the marines and Spaniards continued throughout the 14th and 15th, being supplemented by the bombardment of Caimanera by the warships. The Ladrone Islands were seized June 21 by an American squadron on its way to Manila with reinforcements. Juragua was taken the 24th, and the Spaniards also suffered defeat at Las Guasimas. But the second brilliant achievement of the war occurred July 1–2, when the Spanish earthworks at El Caney and San Juan, Santiago, were carried by assault with heavy loss. The 71st New York and the "Rough Riders," a cavalry regiment organized by Gov. Theodore Roosevelt of New York and commanded by Colonel Wood, with himself as lieutenant-colonel, participated in the assault. On the following day Admiral Cervera, whose fleet had remained inactive in the harbor of Santiago, put to sea, and a running fight between the United States squadron and the Spaniards, who were trying to escape, took place (July 3), in which not a single Spanish vessel escaped, every one being sunk or driven ashore and destroyed. Five days later Admiral Dewey captured Isla Grande, in Subig Bay, near Manila.

In the meantime operations on land progressed so satisfactorily that on July 3 the surrender of Santiago was demanded by Gen. Shafter, but refused by Gen. Toral, and the bombardment continued; but the city held out only a few days longer, and surrendered July 17. The last naval engagement on the Cuban coast occurred in the harbor of Nipe, which was entered and shelled by four American warships, and eventually surrendered.

The investment and impending fall of Manila compelled the Spanish government to make overtures for peace, and a peace protocol was signed Aug. 12, and an armistice declared, but Manila surrendered the next day. A peace commission was appointed by the President Sept. 9, which met the Spanish commissioners in Paris Oct. 1, and after long and earnest conferences Spain accepted the terms of

the United States, and the treaty of peace was signed Dec. 10 at 8.45 P.M. Its provisions were as follows:

Article 1 provides for the relinquishment of Cuba.

Article 2 provides for the cession of Porto Rico.

Article 3 provides for the cession of the Philippines for $20,000,000 as compensation.

Article 4 embraces the plans for the cession of the Philippines, including the return of Spanish prisoners in the hands of the Tagalos.

Article 5 deals with the cession of barracks, war materials, arms, stores, buildings, and all property appertaining to the Spanish administration in the Philippines.

Article 6 is a renunciation by both nations of their respective claims against each other and the citizens of each other.

Article 7 grants to Spanish trade and shipping in the Philippines the same treatment as American trade and shipping for a period of ten years.

Article 8 provides for the release of all prisoners of war held by Spain and of all prisoners held by her for political offences committed in the colonies acquired by the United States.

Article 9 guarantees the legal rights of Spaniards remaining in Cuba.

Article 10 establishes religious freedom in the Philippines and guarantees to all churches equal rights.

Article 11 provides for the composition of courts and other tribunals in Porto Rico and Cuba.

Article 12 provides for the administration of justice in Porto Rico and Cuba.

Article 13 provides for the continuance for five years of Spanish copyrights in the ceded territories, giving Spanish books admittance free of duty.

Article 14 provides for the establishment of consulates by Spain in the ceded territories.

Article 15 grants to Spanish commerce in Cuba, Porto Rico, and the Philippines the same treatment as to American for ten years, Spanish shipping to be treated as coasting vessels.

Article 16 stipulates that the obligations of the United States to Spanish citizens and property in Cuba shall terminate with the withdrawal of the United States authorities from the island.

Article 17 provides that the treaty must be ratified within six months from the date of signing by the respective Governments in order to be binding.

Under the supervision of the evacuation commissioners, the removal of the Spanish troops from Cuba and Porto Rico began immediately after the arrival of the American commissioners in those islands. The complete evacuation of Porto Rico was accomplished by Oct. 17, and on Oct. 18 the United States flag was hoisted at San Juan, and the United States came into formal possession of the island.

The evacuation of Cuba by the Spaniards progressed in Dec., 1898, and was completed Jan. 1, 1899.

SPANISH GRASS; see ESPARTO; PAPER.

SPANISH LANGUAGE AND LITERATURE.

SPANISH LANGUAGE AND LITERATURE: one of the Romanic family of languages—and its literature. The Spanish language (which comprises three principal dialects—Portuguese-Galician, Castilian, and Catalan), like the other Romanic tongues, originated in the *lingua Romana rustica:* see ROMANIC LANGUAGES. The earliest of the Spanish dialects to assume a literary form was the Castilian, which gradually became, and has continued, the classic dialect of the nation. It is spoken throughout central Spain; and the course of Spanish conquest led to its establishment also in Mexico, Central America, Cuba, Porto Rico, the greater part of S. America, the Canary Islands, and the Philippines. The Catalan dialect is spoken in the provinces of Gerona, Barcelona, Tarragona, and Lerida, Castellon de la Plana, Valencia, and Alicante, and in the Balearic Isles. The Galician dialect (closely allied to Portuguese) is confined to the provinces of Pontvedra, Coruña, Orense, and Lugo. The Catalan is allied most closely to Provençal; the Castilian (and still more the Galician) is more akin to Portuguese.

Literature.—The literature of Spain may, in a superficial sense, be regarded as beginning under the auspices of the Romans; for the poets Lucan, Martial, Silius Italicus; and the philosophers and historians, Seneca, Quintilian, Columella, Florus, Pomponius Mela, and other eminent Latin authors, were at least Spanish by birth; and perhaps the Christian ecclesiastical writers of the Gothic period constitute the second link in the historical chain. But in the proper sense of the term, the literature of these two periods is no more *Spanish*—i.e., national—than an English book by an Anglo-Indian is a portion of Hindu literature; or than the sermons preached by a missionary to South Sea Islanders are to be quoted as specimens of the literature of the Pacific. Passing over, then, the various developments of non-national literature in Spain—pagan Latin, ecclesiastical Latin, Arabic, and Jewish—we come to the 12th c., and then, for the first time after the gradual formation of a Spanish language, begin to notice the growth of something like a Spanish literature. Epic and didactic poems appear, in Castilian verse, and full of national sentiment The oldest of these is the *Mystery of the Magian Kings*, a sort of liturgical drama intended to be acted in the Church of Toledo on the feast of Epiphany: it was composed about 1150. Of this piece some fragments are extant. Next after this come two poems on the hero Rodrigo Diaz de Bivar, the Cid (see CID CAMPEADOR), neither of which has been preserved entire: these poems were composed within 100 yrs. after the death of the Cid, or in the last quarter of the 12th c. To the same century or the beginning of the 13th are referred sundry religious and didactic poems, among them Gonzalo de Berceo's *Miracles*, and his *Praises of the Virgin*. Other poems of this period are: *The Book of Apollonius, Prince of Tyre; The Life of St. Mary of Egypt; The Adoration of the Three Holy Kings;* and the poem *Count Fernan Gonzalez*, which, like the *Poema del*

Cid and the *Gesta del Cid*, paints the earnest and picturesque struggle between the Moors and Spaniards. In all these, we trace the influence either of the church or of the chivalric poetry of France; but they maintain, nevertheless, a distinctively national and independent character. A great impulse was given to the artistic development of Spanish literature by Alfonso X. (the Wise) of Castile (q.v.), who substituted Spanish for Latin in the courts of law, and fostered in many ways the growth of the national language. He is regarded as the founder of Spanish prose, his chief work in this department being the compilation of a series of codes, of which the most memorable is *Las Siete Partidas*. He wrote or compiled books also on astronomy, and histories—*General é Grant Historia*, and *Crónica de España*. Subsequent princes walked in his steps, and achieved honorable reputation both as authors and as patrons of literature, conspicious among whom was the Infante Don Juan Manuel (d. 1347), whose *El Conde Lucanor* (Count Lucanor) is a collection of 49 tales, apologues, etc., from oriental sources, and wearing an oriental aspect; he wrote also *Libro de los Estados*, a manual of education, domestic economy, and politics. The most remarkable Spanish poet of the 14th c. is Juan Ruiz, archpriest of Hita (d. 1350). His pieces, composed in a great variety of measures, number about 7,000 verses—religious and love songs, fables, pastorals, etc. The didactic tendency is visible particularly in the *Danza general de la Muerte* (Dance of Death).

The *second* period of Spanish literature embraces the later middle ages, and is marked by the presence of lyric poetry in considerable quantity, with the didactic. It seems to have been inspired by the strains of the Provençal poets settled at the court of the Counts of Barcelona, and always continued to be more courtly than national. The most complete collection of this lyric poetry is the *Cancionero general* of Fernando del Castillo (Valencia 1511; 10th ed. 1573), which contains the names of 136 authors; among whom are the Marquis of Villena and the Marquis of Santillana, the three Manriques, Macias, Sanchez de Badajoz, Alonso de Cartagena, Diego de San Pedro, and Fernan Perez de Guzman. Against this court-poetry, however, a strong reaction took place, the national spirit reasserting itself vigorously in ballads, chronicles, romances of chivalry, and the drama. The best collection of the ballads (about 1,000 in all) is in *Romancero general* (13 vols. 1605-14); of the chronicles (half-genuine, half-fabulous narratives of ancient Spanish heroes), the best are those of Ayala, of Juan Nuñez de Villaizan, the *Chronicle of the Cid*, and the *Chronicle of the Travels of Ruy Gonzalez de Clavijo*; of the romances of chivalry, the most celebrated is the *Amadis de Gaul*, parent of innumerable others (see AMADIS); and of the drama, among the first specimens are the pastoral plays of Juan de la Enzina, and the *Celestina* of Fernando de Rojas.

The *third* period, from the 16th to the 18th c., is the most splendid and productive in the annals of Spanish liter-

ature. Under Charles V., Spain became the foremost state in Europe, and the conquest of Naples brought it into close relation with the literature of Italy. The great Italian masters, as Dante and Petrarch, began to be studied, and Italian measures and poetic forms to be imitated, though the rich, strong, Spanish spirit is never lost. The first of this new school was Juan Boscan Almogaver (d 1543), brilliant sonneteer; other members of the same school are Garcilaso (q.v.) de la Vega, Diego Hurtado de Mendoza (q.v.), Francisco de Saa de Miranda, and Jorge de Montemayor (author of the once famous pastoral novel of *Diana*—see NOVELS), Fernando de Herrera (q.v), and Luis de Leon (d. 1591), the last two of whom rank as the two greatest lyric poets of Spain. Gradually, a national drama established itself. Conspicuous in this department are Villalobos; Perez de Oliva; and Naharro (about 1517), sometimes regarded as the father of the Spanish drama. The last-mentioned wrote his comedies in the favorite national measure, the *redondillas*, and divided them into three acts. Besides these were Lope de Rueda, Juan de la Cueva, Geronimo Bermudez, and others, who cultivated tragedy with success. Among most eminent prose writers of the first section of this third period were Geronimo Zurita, author of *Annales de la Corona de Aragon* (Annals of the Crown of Aragon, 6 vols.)—a somewhat critical work, showing decided advance on the credulous chronicles of the monks; Oliva, whose *Dialogo de la Dignidad del Hombre* (Dialogue on the Dignity of Man) is a fine specimen of elegant literature; and Morales, author of *Discursos* (Essays), relating to practical philosophy, etc. —Cervantes (q.v.) marks, if not exactly a new era, at least a splendid outburst of Spanish genius. It is unnecessary here to criticise the productions of his genius; we only note the fact that his immortal *Don Quixote* put an end to the romances of chivalry—or rather to the extravagant imitations of these that sprang up after the age of chivalry had passed away. Lope de Vega (q.v.), contemporary of Cervantes, and Calderon (q.v.) gave the national drama a European renown, and had, especially the latter, a host of followers more or less celebrated; among whom are Francisco de Rojas, Agustin Moreto, Fragoso, Diamante, Antonio Hurtado de Mendoza, Juan de la Hoz, Antonio de Solis, and Agustin de Salazar y Torres. The lyric and 'epic' poets of this period, which embraces the second half of the 16th and the whole of the 17th c., are innumerable, but not great. The most notable names are those of the brothers Argensola, and Alonso de Ercilla y Zuñiga (author of *Araucana*, fine poem on the conquest of Araucania in Chili by the Spaniards). A peculiar form of the novel also appeared, called the 'rogues' novel,' of which the only memorable specimen is the *Guzman de Alfarache* of Mateo Aleman; and even it derives not a little of its importance from the fact that it suggested Le Sage's *Gil Blas*. In history, the most distinguished names are those of Mariana (q v.) and Solis.

The *fourth* period of Spanish literature extends from the

accession of the Bourbons (1701) to the present time; and was long marked (like the contemporary literature of Germany) by a servile imitation of French models, and these by no means the best of their kind. This literary ascendency of France in the first half of the 18th c. over all civilized Europe is a very curious phenomenon, worthy of closer study than it has yet received. The most notable of the Frenchified Spaniards was Ignacio de Luzan, whose *Poetica* (1737) is a thoroughly Gallican performance. His efforts to denationalize the literature of Spain were combated by Garcia de la Huerto and others, and at length a sort of compromise was effected, and the 'Salamanca School' emerged into notice. Its founder, Melendez Valdez (b. 1754), was a man of high genius, who subordinated his liberal culture to the sovereign control of a patriotic inspiration; and the same qualities are visible in its other members—Iglesias, Noroña, Quintana (q.v.), Cienfuegos, Arriaza, and Gallego. The great Peninsular war, and the subsequent political movements in Spain, had a powerful effect in stirring up anew the elements of nationality, and the 19th c. can show a lengthened list of names both in prose and poetry.

Only a few of the names most distinguished in recent Spanish literature can be given here. The following poets most clearly exhibit the quickening effect of the national strife on the popular thought: Xérica, Lista, Martinez de la Rosa, José Joaquin de Mora, Angel de Saavedra, Breton de los Herreros. Of the poets who in more recent times have infused into Spanish literature a new life may be named: Espronceda, Serafin Calderon, Zorrilla, Hartzenbusch, R. de Campoamor, Santos Lopez Pelegrin, Villergas, Gertrudis Gomez de Avellaneda, Arnao, Gil, Campo-Arana, José Gonzalez de Texada (satirist); and the lyrists Antonio de Trueba, Gaspar Bueno Serrano, and especially Ventura Ruiz Aguilera and Nuñez de Arce. The most noteworthy dramatists are Leandro Fernandez Moratin, with Martinez de la Rosa, Saavedra, and others above named. In romantic fiction the most eminent names are Escosura, Martinez de la Rosa, Larra, Maria del Pilar, and 'Fernan Caballero.' Of writers of history there are: Ulloa, Muñoz, Capmany, Ferreras, Quintana, Navarrete, Clemencin, Balmes, Torreno, Muñoz Maldonado. Jovellanos, Arguelles, Miñano, Marina, Donoso Cortes, Martinez de la Rosa, and Castelar have excelled in political oratory. The most notable works in philosophy and criticism are those of Gallardo, Salvá, Lista, Hermosilla, Marchena.

Spain has not yet achieved great results in any departments of science, physical, mental, or moral; but of late years she has turned her attention seriously to scientific studies, and several admirable treatises in jurisprudence, political economy, medicine, philosophy, philology, and geography have been produced.—See Bouterwek's and Sismondi's *Histories of Spanish Literature;* and above all, Ticknor's work on the same subject (3 vols. New York 1849–54), which has been translated into Spanish.

SPAN'ISH MACK'EREL (*Scomberomorus maculatus*): fish allied to the common mackerel (*Scomber scombrus*); but differing from it in having the back lead-color, without wavy bands, and the side marked with 25–30 spots; also in having 8 finlets between the second dorsal fin and the tail, instead of 5. Though very abundant, in some years especially, at a considerable distance from shore, it is not so readily taken in large quantities as the common mackerel; and this, with its superior excellence as food, gives it the high average price of 60 cents a lb. in New York (1891, Oct., 75 cents). It sometimes weighs 8–9 lbs., but rarely exceeds 3–4. It ranges from the West Indies to Me., appearing s. in early spring, and in July off New York.—Of the same genus are the Cero (*S. caballa*), with 14 1st-dorsal spines, and no spots, except yellowish when young; the Spotted Cero (*S. regalis*), with a spot of deep blue on the white 1st dorsal; and the Monterey Mackerel (*S. concolor*), which is high-priced.—In England, the name S. M. is given to the Chub, Bull, Big-eyed, or Mixed Mackerel, or Thimble-eye (*Scomber colias*), which has wavy bands broken into spots on the side ; it sometimes appears in schools on our coast, and is thought by some to be identical in a younger stage with *S. pneumatiphorus* of the Mediterranean, and *S. Diego* of Cal.; the lower half of its sides lacks the gray spots.

SPAN'ISH MAIN (i.e., *main-land*): term formerly denoting the n.e. coast of S. America, from the Orinoco to the Isthmus of Darien; also the contiguous s. portion of the Caribbean Sea, traversed by the Spanish treasure-ships: the term is frequent in connection with the history and exploits of Buccaneers (q.v.).

SPAN'ISH TOWN: seat of govt. of the British possession of Jamaica (q.v.), on the right bank of the Cobre, 10 m. w. of Kingston. It contains several important public institutions, but is ill built and unhealthful. Pop. about 6,000.

SPANK, n. *spăngk* [W. *ysponc*, a smack, a skip or quick bound: Low Ger. *spenkern*, to run and spring about]: a sounding blow with the open hand. V. to strike with the open hand. SPANK'ING, imp.: ADJ. dashing; free-going; strong; large. SPANKED, pp. *spăngkt*. SPANKER, n. *spăngk'ĕr*, something very large, or larger than common; a large quadrilateral sail with parallel sides set between the gaff and boom of a ship, and having its foreleech attached by rings to the mast. The spanker is a fore-and-aft sail of great importance in bringing the vessel to the wind. SPANKING BREEZE, forcible breeze.

s, s, Spanker.

SPANNER, n. *spăn'nĕr* [see SPAN 1]: an iron tool used to tighten the nuts of screws.

SPAN-NEW, a. *spăn'nū* [Icel. *spánn;* Ger. *span,* a chip, and Eng. *new*]: quite new; brand-new; as new as a fresh chip.

SPAR, n. *spâr* [AS. *spæren,* gypsum: Ger. *spath,* spar]: a term applied to any bright crystalline mineral, and adopted by mineralogists in the names of a number of minerals—e.g., calcareous S., fluor S.; though in these the term has no proper generic significance. SPAR'RY, a. *-rĭ,* resembling spar, or consisting of spar; having a confused crystalline structure.

SPAR, n. *spâr* [Dut. *spar,* a rod: Ger. *sparren,* a rafter: Dan. and Sw. *sparre,* a bar, rafter: Ir. and Gael. *sparr,* a joist]: any long round piece of timber, as a mast, a yard, a boom, etc. SPAR-DECK, the upper deck of a vessel, especially a frigate, on which spare spars are usually placed.

SPAR, v. *spâr* [AS. *sparrian,* to shut (see SPAR 2)]: to close or fasten with a spar; to bar. SPAR'RING, imp. SPARRED, pp. *spârd.*

SPAR, v. *spâr* [a metaphor from cock-fighting, when the cock has its *spurs* covered to embolden it to fight: OF. *esparer,* to fling or jerk out with the heels: Low Ger. *sparre,* a struggling, striving]: to fight in show, or as preparatory to a real contest, as a pugilist; to box in gloves; to wrangle; to quarrel in words: N. a feigned blow; a contention with the fists. SPAR'RING, imp.: N. the act of fighting in show, as a pugilist. SPARRED, pp. *spârd.* SPAR'RER, n. *-rĕr,* one who spars.

SPARABLE, n. *spăr'ă-bl* [corruption of *sparrow-bill,* so called from its shape: comp. Gael. *sparrag,* a nail, a rivet]: a small nail used by shoemakers for putting into the soles and heels of shoes to make them wear longer. *Note.*—The literal meaning of SPARABLE may be simply, that which *spars* or *rivets:* see SPAR 3.

SPARADRAP, n. *spăr'a-drăp,* or SPARADRAB, n. *spăr'a-drăb* [F.]: in *phar.,* an adhesive plaster spread on linen or paper; a cerecloth.

SPARE, a. *spär* [Icel. *spara;* Ger. *sparen;* L. *parcĕrĕ,* to spare: AS. *spær;* Icel. *sparr;* L. *parcus,* sparing]: scanty; frugal; not abundant; held in reserve; not required for present use; lean: V. to refrain from using, taking, or doing something; to part with willingly; to do without; to treat with tenderness or forbearance; to live or use frugally; to save from any particular use; to exercise forbearance; to treat with pity; not to afflict; to forbear. SPAR'ING, imp.: ADJ. scanty; frugal; chary; penurious: N. in *OE.,* parsimony. SPARED, pp. *spärd.* SPARE'LY, ad. *-lĭ,* or SPAR'INGLY, ad. *-lĭ,* moderately; not lavishly; not abundantly; cautiously; tenderly. SPAR'INGNESS, n. *-nĕs,* the quality of being sparing; parsimony. SPARE'NESS, n. state of being spare; leanness. SPARE-RIB, a piece of the side of a pig, consisting of ribs with little flesh on them.—SYN. of 'spare, v.': to omit; forbear; grant; allow; indulge; save;

—of 'spare, a.' lean; meagre; thin; parsimonious; superfluous; scanty;—of 'sparing, a.': scarce: little; scanty; parsimonious; chary; merciful.

SPARGE, v. *spârj* [L. *spargĕrĕ*, to scatter, to throw about]: in *brewing*, to throw water upon in a shower of small drops, that it may percolate equally through a mass. SPAR'GING, imp. SPARGED, pp. *spârjd*. SPARGER, n. *spâr'jĕr*, a vessel with a perforated bottom, used for dashing or sprinkling water.

SPARIDÆ, *spăr'ĭ-dē*: family of acanthopterous fishes, having general resemblance to the Perch family—a single dorsal fin, not protected by any scales, and whose anterior rays are spinous, the pectoral and ventral fins sharp-pointed, the tail-fin notched; the gill-cover shining, without proper spines or denticulations; the palate destitute of teeth; the scales large, broader than long, and generally thin. There are several sections of the family, distinguished by the teeth, which in some are all small and card-like, while others have trenchant, conical and round molar teeth, variously arranged. The greater number inhabit the seas of warm parts of the world; many species are found in the Mediterranean; a few on the coasts of Britain: see GILTHEAD. Several Brit. species of different genera are known by the common name Sea Bream (q.v.). The S. are generally good for food; some are highly esteemed—among them the *Sargus* of the Mediterranean (*Sargus Rondeletii*), much valued by the ancient Romans, and the Porgy, the Scup, and the Sheepshead of the N. American seas. Of the American fishes of this family, the Sheepshead (*Diplodus probatocephalus*) is highly esteemed as a food-fish.

SPARK, n. *spârk* [Lith. *spragĕti*, to crackle, as fire-wood on the fire: Dan *sprage*; Icel. *spraka*, to crackle (see SPRAG 2)]: a small piece of ignited matter which crackles and flies off from a body during combustion; a small portion in a state of activity, as of life: a gay young fellow; a brisk showy man; a lover SPARKLE, v. *spâr'kl*, to fly off in sparks; to glitter; to exhibit an appearance of animation, as the eyes; to emit little bright bubbles, as liquors: N. a little spark; a slight ebullition, as of temper; a gleam; brightness. SPAR'KLING, imp. *-klĭng*: ADJ. bright as a spark; glittering; lively. SPAR'KLED, pp. *-kld*. SPAR'KLER, n. *-klĕr*, he or that which sparkles. SPAR'KLINGLY, ad. *-lĭ*, with vivid and twinkling lustre.—SYN. of 'sparkle, v.': to beam; gleam; glimmer; ray; glitter; shine; glisten; scintillate; coruscate; radiate.

SPARKS, *spârks*, JARED, LL.D.: American historian: 1789, May 10—1866, Mar 14; b. Willington Conn. He graduated at Phillips Exeter Acad.; and at Harvard Coll. 1815; became tutor in mathematics and nat. philosophy at Harvard, and one of the conductors of the *North American Review*. In 1819, having studied at the Harvard Divinity School, he was settled as a Unitarian minister at Baltimore, when he wrote *Letters on the Ministry, Ritual, and Doctrines of the Protestant Episcopal Church*. In 1821 he es-

tablished a periodical, the *Unitarian Miscellany and Church Monitor*, in which he published his *Letters on the Comparative Moral Tendencies of the Trinitarian and Unitarian Doctrines*. In 1823 he edited six volumes of essays and tracts on theological subjects, and, abandoning the pulpit, became for seven years sole editor of the *North American Review*. In 1828 he published a *Life of John Ledyard, the American Traveller;* and 1834–37 edited at Boston 12 octavo vols. of the *Writings of George Washington*. This important national work was followed by *Diplomatic Correspondence of the American Revolution* (12 vols. 8vo, Bost. 1829–30), and the *Life of Gouverneur Morris* (3 vols. 8vo, Bost. 1832). At this period he commenced the *American Almanac of Useful Knowledge*, and began also his *Library of American Biography*, issued first in two series of 10 and 18 vols. 18mo. In 1840 was published his collection of the *Works of Benjamin Franklin* (10 vols. 8vo), after which he visited Europe to collect materials for his *Correspondence of the American Revolution* (4 vols. 8vo, 1854). He wrote 1852 two pamphlets in answer to Lord Mahon, who had sharply criticised the *Life of Washington* and other works, for S.'s evident process of refining and exalting the style of the letters quoted—including even the substitution of elegant for objectionable terms: no charge of change of meaning was involved.—Besides these multifarious literary labors, combining laborious research with clear arrangement, a simple style, and accurate statement, S. filled in Harvard, 1839–49, the M'Lean chair of history, and from 1849 to his departure in ill health for Europe 1853, Feb., was pres. of Harvard College.

SPARLING, n. *spär'ling* [Ger. *spierling*]: a smelt.

SPARROW, n. *spăr'rō* [Goth. *sparva;* Icel. *spörr;* Dan. *spurv;* Ger. *sperling*, a sparrow]: genus of birds (see below). SPARROW-GRASS, corruption of ASPARAGUS (q.v.). SPARROW-HAWK, species of small short-winged hawk (see below).

SPAR'ROW: common name for many species of birds, of family *Fringillidæ;* having a strong conical bill, adapted to seed eating, the primaries nine, and the tarsus not scutellate behind. The Common S., or House S. (*Passer domesticus*), plentiful everywhere in the British Islands, is found also throughout Europe, abounding particularly in the n. countries, from which its range extends e. into Siberia, and s. to n. Africa and n. India.

In the United States this species, which should be called the European House Sparrow, is known as the English S. It was imported by Nicholas Pike and other directors of the Brooklyn Institute 1850, for the destruction of caterpillars; after which there was a 'craze' of importation and distribution, until at the end of 36 years it had overspread the country to Fla. on the s., and w. to central Kan. and Neb., with colonies in Ut. and Cal., a total of 885,000 sq. m., besides 148,000 sq. m. in Canada—its diffusion helped much by grain-cars and grain scattered on railroad tracks. Its broods are 4–6

a season, each numbering 4–7 eggs; the rate of increase was 50,000 a year in the U. S. 1888; and is always increasing by rapid geometric ratio. Since 1880 it has been generally recognized as one of the greatest manifold pests of al animals in this country, stripping trees of buds, destroying vines and trees by its corrosive filth, plucking fruit-germs from blossoms, ruining fruit by pecking, devouring small fruits and grain and valuable seeds, plucking young and tender vegetables, stripping cedar or other bark for its enormous nests, choking roof gutters and pipes, even causing fires by combustible material, defacing buildings and statues, etc., and driving away our native birds, such as bluebirds, martins, wrens, orioles, etc.; its various offenses, however, varying somewhat with locality. Only its young in the nest and for a week after leaving it are fed on insects, numerous dissections proving that the mature bird is of no value as an insect-destroyer. Laws looking to its repression or extermination (the latter now impossible) have been passed by Mass., Mich., N. J., N. Y., Ohio, Penn., and R. I.—Ohio offering a 1-cent bounty per head, and N. Y. making it a misdemeanor to give food or shelter to the bird. In Albany, many were bought for the markets at $1 per hundred, and elsewhere they have been sold as reed-birds for pot-pie; but to be in desirable condition they should be captured and for a few days fed on meal. In the cities they live much on horse excrement. In Australia and New Zealand they have been introduced, and are a great scourge. For means of destruction, and for an exhaustive discussion, see the bulky bulletin of the U. S. dept. of agri., *The English Sparrow*, 405 pp. (1889); also *The House Sparrow*, by T. G. Gentry (1878), and *On the Present Status of Passer Domesticus in America*, etc., by Elliot Coues (1879). Much has been published condemnatory of this bird in England, even before its introduction to this country; but in Europe it has natural checks to great increase, which, as in the case of many of our foreign weeds, and of introduced rabbits in Australia, are needful to prevent enormous multiplication.

The Tree S. (*P. montanus*), the only other British species, is very similar to the Common S., but rather smaller. It is widely distributed over great part of the old world, though rarely seen in towns.—In Italy the Common S. is rare to the s. of Piedmont; and another closely allied species (*P. cisalpina*) takes its place, very similar in habits and in characters.

In N. America, the species that happen to be *named* sparrows, instead of finches, etc., are the following, all more or less decidedly spotted or streaked: the Yellow-winged S. and the smaller Henslow's S., with edge of wing conspicuously yellow, the latter species not common; the rare similar Leconte's S., in Missouri river region and Tex.; the Savanna S., of wide distribution, with edge of wing yellowish, and its long-billed congener, the Sea-shore S., without the yellow; the Song S. and its varieties, the breast with a central blotch, and the body everywhere streaked, without yellow: the Swamp S., with wings edged with bright bay:

the Tree S. (not the same as the European), with an obscure blotch on the breast, which is not streaked in the adult; the familiar Chipping S.; the Field S., of the size of the Chipping S., but the ashy parts of the latter replaced by pale brown; the western Clay-colored S. and Black-chinned S.; the rusty-red Fox S.; and the following (even larger than the Fox S.), all with two white wing-bars, and head more or less black: the White-throated S., edge of wing yellow; the White-crowned S., the head with medium broad white stripe; the Pacific coast Golden-crowned S.; and the Harris S. of the Missouri river region, with whole crown, face, and throat black.—The bird called S. in the Eng. translation of the Bible is a species of thrush.

SPAR'ROW-HAWK (*Accipiter* or *Nisus*): genus of *Falconidæ*, ranked among the *ignoble* birds of prey (see FALCONIDÆ: FALCONRY). The bill is curved from the base, short, and compressed; its upper ridge rounded and narrow; the cutting margin of the upper mandible with a distinct festoon. The wings are short; the legs long, slender, and smooth. One species is British—the COMMON S. (*A. nisus*, *A.* or *N. fringillarius*), a small hawk, only about 12 inches in length, a considerable portion of the

Sparrow-hawk (*Accipiter nisus*).

length belonging to the tail. It is found also in Asia as far s. as Bengal, and as far e. as Japan. It very often makes its nest in the deserted nest of a crow. It is a bold, active bird, very destructive to poultry and pigeons. The S. has often been trained for purposes of falconry, to take land-rails, partridges, and similar game. The S. of Australia (*A. torquatus*) is marked by a collar of numerous bars of white: its habits are similar to those of the European sparrow-hawk.—The American S. (*Falco sparverius*), common in most parts of the United States, is similar in size to the European S., but is allied rather to the kestrel. It is one

of our prettiest birds, about the size of a pigeon, the head slaty blue, the back rufous, the tail bright chestnut, the underparts white, and the body and tail more or less spotted or barred according to sex. It is a sanguinary destroyer of small birds. Other Amer. species are described.

SPARRY: see under SPAR 1.

SPARSE, a. *spârs* [L. *sparsus*, scattered—from *spargĕrĕ*, to scatter: It. *sparso:* F. *épars*]: thinly scattered; not dense SPARSE'LY, ad. *-lĭ.* SPARSE'NESS, n. *-nĕs*, state of being sparse; thinness.

SPARSE, v.: OE. for DISPERSE.

SPARTA, *spâr'tâ* (anciently LACEDÆMON): the most famous city of Peloponnesus, and next to Athens the most powerful and important of the Greek states—for S. was not so much a city as a group of villages occupying partly a range of low hills on the right bank of the Eurotas, and partly the intervening plain. It lay picturesquely between the mountain ranges of Parnon and of Taygetus, which rose to its greatest height of 7,900 ft. in the anc. Taleton (now St. Elias) near the city. At the n. end this valley was closed by the mountains of Arcadia; at the s. end its two mountain walls projected far into the sea. The mountains were clothed with primeval forests, in which the Spartans hunted the stag and the wild-boar. S., even in its palmiest days, had an appearance far below its renown; for, though not destitute of handsome public buildings, the severe law ascribed to Lycurgus, that 'the doors of every (private) house should be fashioned only with the saw, and the ceiling with the ax,' cramped the development of architecture and the fine arts. The natural defenses of the place, or at least, of the long valley of Lacedæmon (now known as Laconia), in which S. stood, were so great that it continued unfortified till the Macedonian period—nearly a century after its mighty struggle with Athens for the hegemony of Greece; indeed, it was not regularly fortified till the time of the tyrant Nabis (B.C. 195). Its mountain barriers gave few practicable passes for an invading army. Previous to the Dorian conquest, the primitive Achæans of S. seem to have dwelt in four or five unconnected hamlets. These hamlets, welded into a sort of city by the conquerors, became known as town-districts. The city, however, never had the compactness of other great Grecian cities; its houses mostly stood in large gardens or open grounds. The Acropolis of S. occupied a hill in the n. part of the city, and was adorned with a temple to Athena (the tutelary goddess of S.), plated with bronze, whence it was called the Brazen House, and the goddess herself *Chalciœcus* (Dweller in the Brazen House). On the bronze plates were beautifully sculptured various Greek myths. At the e. base of the Acropolis stood the Agora, or Market-place, whence streets proceeded to the different quarters of the city: here stood the public buildings of the magistrates. The Agora contained many statues. The principal street in S., called the Aphetaïs, ran s. from the Agora to the s. wall, through the most level part of the

city, and was lined with a long succession of monumental edifices, chiefly *heroa* and sanctuaries. Along the banks of the Eurotas stretched the *Dromos* (Race-course), in which were several *gymnasia*, with temples of the Dioscuri, of the Graces, etc., and numerous statues; and still further s. lay a broader level, Platanistas, so called from the plane-trees that grew there. This was the scene of those mock-contests in which the Spartan youth learned to face without fear the realities of war.

The history of S. is really the history of Laconia, or of the s.e. Peloponnesus. *When* the four hamlets, the *Pre-Dorian* S., originated, we have no knowledge; but doubtless their inhabitants were Achæans. To the period during the rule of the Achæan princes, the events of the famous but unhistorical expedition against Troy, forming the subject of Homer's *Iliad*, are ascribed. Menelaus, husband of Helen, whose flight with Paris occasioned the Trojan war, was king at S., and it was during the reign of his grandson, Tisamenus (according to the legend), that the Dorians (q.v.—see also DORIS) invaded Peloponnesus. The *fact* of a Dorian invasion is universally admitted; but of the details, scanty even as they are, we may safely be skeptical. We cannot be certain of the date of the event —not even of its century. All that is clear is, that the native Achæan population were deprived of political privileges; and appear thenceforth as *Periœci* (q.v.) and Helots (q.v.)—the Dorian conquerors alone forming the historical Spartans. Toward the middle of B.C. 8th c., the Dorians of S. had not only thoroughly established themselves in their new settlement, but had subjugated the whole of the fertile and beautiful vale of Lacedæmon, commonly known as Laconia, and had begun to cherish ambitious views of extending their supremacy over the other Dorian settlements in Peloponnesus—viz., Messenia and Argos. Hence originated the Messenian wars (see MESSENIA), which terminated B.C. 668 in the complete overthrow of the Dorians of Messenia, who were reduced by the victorious Spartans to the condition of Periœci. Similar struggles occurred both with the older Achæan inhabitants in the centre of Peloponnesus and with the Dorians of Argos, etc., in which the Spartans were generally successful. The development of their warlike and ambitious character is usually ascribed to the institutions of Lycurgus (q.v.); and whatever we may think of that nearly mythical personage, the institutions connected with his name were fitted to make the Spartans exactly what they figure in history—a race of stern, cruel, resolute, rude, and narrow-minded warriors, capable of momentary self-sacrificing patriotism (as in the story of the 300 heroes who fell at Thermopylæ), but without the capacity for adopting or appreciating a permanently noble and wise policy. The outbreak of the Peloponnesian war (B.C. 431) brought the rivalry between S. and Athens to a head; and in the mighty struggle that ensued, victory declared on the side of the combatant least capable of maintaining the greatness of Greece. S. now attained the hegemony of Greece, but her insolent tyranny in her hour

of triumph excited fierce and lasting indignation; and the valorous retaliations of the Thebans under Epaminondas (q.v.) stripped her of all her splendid acquisitions, and reduced the Laconian state to its primitive boundaries. Later, the rise of the Macedonian power limited still more the Spartan territory, and it never regained its earlier dimensions. Finally, after a series of vicissitudes, S. passed into the hands of the Romans, became a portion of the Roman province of Achaia, and shared the fortunes of the great republic.

SPARTACUS, *spär'ta-kŭs:* leader in the great insurrection of Roman slaves in s. Italy B.C. 73; probably in point of genius the first servile captain of whom history preserves a record. He was a native of Thrace, perhaps descendant of the kings of Panticapæum. He served in the Roman army, but having deserted was captured and reduced to slavery. Being destined for the arena, S. was placed in a training-school for gladiators, at Capua. A conspiracy to escape was formed among the gladiators (200 in all, mostly Gauls and Thracians), the heads of which were S., and two Gauls, Crixus and Œnomaus. The conspiracy was discovered; but 70, among whom were the leaders, forced their way through the streets of Capua, with such rude weapons as they could seize, defeated a detachment of Roman soldiers sent to bring them back, and established themselves on Mount Vesuvius, where they received considerable accessions to their number—chiefly runaway slaves. 3,000 Roman troops under C. Claudius Pulcher sought to blockade them and starve them into surrender. S. was now chosen as their leader, with Crixus and Œnomaus for lieutenants. Descending the hill at a place and in a way totally unexpected, he took his assailants in the rear, and inflicted on them a disgraceful defeat. His original design had been limited to securing his freedom and making his way back to his own country, nor during the two years that the insurrection lasted did he ever forget this ultimate aim; but to effect this, he saw the necessity of a serious and extensive warfare; and proclaiming freedom to all slaves, he raised his trivial mutiny to the dignity of a servile war. Circumstances were favorable. A great portion of Italy, especially of central and s. Italy, had been turned into pastureland (see ROME), and instead of villages of sturdy and independent farmers, who owned the land they tilled, gangs of discontented slaves watched the flocks and herds of great nobles who were demoralized by a plethora of ill gotten riches. To these slaves S. appealed; they rushed to his standard, and victory followed him. The story of his triumphs reads like a romance. No knight of chivalry was ever more uniformly successful, for a time. After defeating Claudius Pulcher, he routed and slew Cossinius, legate of Publius Varinius; then he worsted Varinius himself in several engagements, capturing his lictors and the very horse on which he rode. All the s. part of the peninsula now fell into his hands: the country was devastated, the cities either pillaged or garrisoned. But

S. knew too well the enormous resources of Rome, and the extraordinary energy which she was capable of developing in peril, to hope for final reduction of her power; consequently he sought to induce his victorious bands to march n. to the Alps, and thence disperse to their own homes. But the slaves were too deeply intoxicated with their success; and S., against his better judgment, had to continue his career of mere fighting, embarrassed by the jealousies apt to spring up among undisciplined hordes. His military career was gallant, brilliant, and skilful. After the defeat and death of his two lieutenants, who had separated from him (B.C. 72), he marched n. through Picenum toward the Po; overthrew first one consular army under Cneius Cornelius Lentulus, then another under Gellius Poplicola; and at the head of 100,000 men meditated a march on Rome. Since the days of Hannibal, the city had seen no such danger. But servile indecision and unwisdom saved the city. S. was forced by his followers to retreat s., and took up his winter-quarters at Thurii, where he held a great fair for the sale of the spoils of Roman cities. B.C. 71 the pretor Marcus Crassus (q.v.) took the field against the terrible liberator, but for a while even he could do nothing. Near Mutina, the proconsul, C. Cassius Longinus, and the propretor, Cn. Manlius, were defeated; in Picenum, Mummius, legate of Crassus, was utterly routed; at last, however, Crassus succeeded in forcing S. into the narrow peninsula of Rhegium, whence he tried to cross into Sicily, with the view of rekindling the servile war that had recently raged in that island. In this attempt he failed, through treachery of those with whom he had opened negotiations. Crassus now built lines of circumvalation to hem him in and force him to surrender; but one stormy winter-night, S. broke out of the toils prepared for him, and resumed the offensive, though he had suffered heavily by loss and desertion, and his forces had been still further diminished by the formation of an independent army of Gallic slaves, which had no sooner got a leader of its own than it was annihilated by the enemy. Near Petelia, he once more defeated his adversaries; but seeing clearly that with such wretched materials as he had he could not hold out much longer, he made a dash at Brundusium, hoping to seize the shipping in the harbors and get safely across the Adriatic to his native shore, but was baffled by the presence of Lucullus (q.v.). Pompey, too, had returned from Spain, and was nearing the scene—ready, as usual, to reap his unearned laurels. There was nothing left for S. but to die as gallantly as he had lived. Drawing up his army in battle-array, and solemnly slaying his war-horse, he began his last fight in a spirit of heroic desperation (B.C. 71); and after performing prodigies of valor, fell unrecognized among the heaps of his slain foes. His death ended the great insurrection, and 6,000 slaves who had escaped death in the battle were crucified along the high-road from Capua to Rome.

SPARTAN, a. *spâr'tăn:* pertaining to anc. *Sparta;* hardy; brave. SPARTAN DOG, a blood-hound.

SPARTANBURGH, *spâr'tan-berg:* city, capital of Spartanburgh co., S. C.; on the Richmond & Danville and the Georgia Central railroads; 93 m. n.w. of Columbia. It is in a wheat, corn, stock-raising, dairy, gold, iron, and limestone region; has excellent water-power; operates gold and iron mines and limestone quarries; and has several churches, separate high schools for boys and girls, Wofford College (Methodist Episcopal), banks, and daily and weekly periodicals. Manufactures include carriages, wagons, and bricks. Pop. (1910) 17,517.

SPARTEINE, n. *spâr'tĕ-ĭn:* a vegetable base extracted from the broom (*Spartĭum scopārĭum*): in the form of a volatile oily liquid.

SPARTEL, *spâr-tĕl',* Cape: Morocco, Africa, the n.w. extremity of the continent. It is a promontory 1,030 feet high, situated at the w. entrance to the Strait of Gibraltar.

SPASM, n. *spăzm* [F. *spasme,* spasm—from L. *spasmus;* Gr. *spasmos,* a cramp, spasm—from *spaein,* to draw]: a sudden contraction of the muscles of the body, of short duration, generally attended with pain. SPASMODIC, a. *spăz-mŏd'ĭk* [Gr. *spasmōdēs,* convulsive]: relating to spasms; convulsive; done by fits and starts. SPASMOD'ICALLY, ad. *-lĭ.* SPASMODIC SCHOOL, the class of authors whose writings abound in forced conceits.—*Spasm* is of two sorts. In one, there is an unusually prolonged and strong muscular contraction, not rapidly alternating with relaxation, the relaxation taking place only slowly, after some time: this is known as *tonic spasm* [Gr. *tŏnŏs,* a bracing up] or *Cramp* (q.v.). When in a more moderate degree affecting the voluntary muscles generally, it constitutes Catalepsy, in which, from the muscles remaining contracted, the limbs will retain whatsoever attitude they are placed in, until the spasm is over. But the extreme example is Tetanus (q.v.), in which the spasms are violent and enduring. In the other form of spasm, the contractions of the affected muscles take place repeatedly, forcibly, and in quick succession; the relaxation being, of course, equally sudden and frequent. This is named *clonic spasm* [Gr. *klŏnŏs,* an agitation], and is popularly known as *convulsions:* chorea (or *St. Vitus's dance*) and epilepsy afford examples.

The treatment varies according to the cause of the excessive muscular irritability. Firm pressure on muscles affected with spasm will promote their relaxation; and by strong, steady pressure on the masseter muscles, the lower jaw has been depressed, so as to open the mouth, in case of lock-jaw. The medicines employed to counteract irregular or inordinate muscular action are termed *antispasmodics;* but spasm may depend on so many different causes that successful remedies must vary ex-

tremely; though a few appear to exercise control over spasmodic action generally. These, which may be termed *pure* or *true* antispasmodics, are asafetida, galbanum, musk, rue, sumbul, and valerian. Among the narcotics often useful in these affections are, especially, belladonna, cannabis indica (or Indian hemp), opium, and stramonium. Sulphuric ether in draught or inhaled, and inhaled chloroform, are often of service. In some cases, measures which directly depress the vital powers, e.g., prolonged use of the warm bath, are the most effectual means of subduing spasm.

SPASTIC, a. *spăs'tĭk* [L. *spastĭcus;* Gr. *spastĭkos,* afflicted with cramp or spasms—from *spaein,* to draw]: relating to spasms; having the power to draw to or from —applied to muscular contractions in disease. SPAS'TICALLY, ad. *-lĭ.* SPASTICITY, n. *spăs-tĭs'ĭ-tĭ,* tendency to suffer spasms; a state of spasm.

SPAT, v. *spăt:* pt. of SPIT 2, which see.

SPAT, n. *spăt* [Icel. *spyta;* Dan. *spytte,* to spit (see SPIT 2)]: the spawn or young ejected by shell-fish.

SPATE, or SPAIT, n. *spāt* [Gael. *speid,* a mountain torrent in flood, an overflow]: in *Scot.,* a sudden heavy flood, especially in mountain rivulets, caused by heavy rainfalls; a heavy rainfall; a sudden inundation.

SPATHE, n. *spāth,* or SPATHA, n. *spā'thă* [L. *spatha;* Gr. *spathē,* a broad blade]: in *bot.,* a large membranous bract or kind of leaf forming a sheath which incloses one or more flowers, as in the *Narcissus.* Very frequently the flowers within a spathe are arranged on a *spadix,* which is a succulent spike, with numerous flowers, and of which a familiar example is the Indian turnip or Jack-in-the-pulpit (*Arisæma triphyllum*), which has a green or purple-variegated spathe forming the canopy of the 'pulpit.' The spadix is a characteristic feature of the Palms, and in them is compound or branching. and in general is provided not only with a common spathe, but also with secondary spathes at its divisions. SPATHED, a. *spāthd,* having a spathe or calyx like a sheath. SPATHACEOUS, a. *spā-thā'shŭs,* having the appearance and membranous consistence of a spathe. SPATHAL, a. *spā'thăl,* furnished with a spathe. SPATHELLÆ, n. plu. *spā-thĕl'lē* [L. dim.]: small spathes surrounding separate parts of the inflorescence. SPATH'OSE, a. *-ōs,* having a spathe; resembling a spathe.

SPATHIC, a. *spăth'ĭk* [F. and Ger. *spath,* a leafy stone, spar]: in leaves or plates; applied to minerals having an even, lamellar, or flatly foliated structure. SPATH'OSE, a. *-ōs,* in *min.,* having the characters of spar; occurring in broad plates or lamellæ; foliated in texture. SPATH'IFORM, a. *-ĭ-fawrm* [L. *forma,* shape]: resembling spar in form.

SPATHULATE, a. *spăth'ū-lāt:* another spelling of SPATULATE. See under SPATULA.

SPATTER, v. *spăt'tĕr* [Dut. *spatten*, to splash (see SPIT 2 and SPOT)]: to scatter a liquid substance on; to sprinkle with some dirty matter; hence, to asperse; to defame. SPAT'TERING, imp.: ADJ. in *OE.*, for SPUTTERING. SPATTERED, pp. *-tĕrd.* SPAT'TERDASHES, n. plu. *-dăsh'ĕz* [Eng. *dash*, to scatter]: coverings for the legs to keep them clean from mud and wet; leggings.

SPATTLE: see SPATULA.

SPATULA, n. *spăt'ū-lă*, sometimes SPATTLE, n. *spăt'tl* [L. *spat'ula* or *spath ula*, a spoon—dim. of *spatha;* Gr. *spathē*, a broad blade: It. *spatola:* F. *spatule*]: a flat sort of knife used by apothecaries for spreading plasters, etc. SPAT'ULATE, or SPATH'ULATE, a. *-ū-lāt*, in *bot.*, shaped like a spatula or a battledore; more or less rounded toward the summit and narrowed toward the base—applied to a leaf like that of the daisy.

Spatulate Leaf.

SPATULE, n. *spăt'ūl* [L.—from *spatula*, L. dimin.—from *spatha*, spade]: a spatula; in *ornith.*, a broadening of the vanes at the end of the rectrices in some birds.

SPAULDING, *spawl'dĭng*, LEVI, D.D.: 1791, Aug. 22—1873, June 18; b. Jaffrey, N. H.: missionary to Ceylon. Graduated at Dartmouth Coll. 1815, and Andover Theol. Seminary 1818, he was sent by the Amer. Board 1820 to Jaffna, Ceylon, where he labored till his death—more than half a century. Incidentally, he (with Mrs. S.) superintended a female seminary at Oodooville. He was a thorough scholar. Much of his labor was given to preparing books in the Tamil language, of which he had perfect command in speaking as well as writing. Dr. S. preached in houses, or by the roadside, or wherever he could get a hearing. He published a *Tamil Dict.* (1844), and an *English and Tamil Dict.;* a revision of the Bible in Tamil; and, in that language, *Notes on the Bible; Scripture Hist.;* a translation of *Pilgrim's Progress*, school-books, tracts, etc. He was also author of many of the most meritorious hymns in the Tamil hymnal used by the missions. Dr. S. gained the love of the natives. His age, 82, at death, exceeded that of any missionary of the Amer. Board, at the time.

SPAVIN, n. *spăv'in* [It. *spavenio;* OF. *esparvain*, a cramp or convulsion of sinews in horses: O. Dut. *spat*, a cramp]: disease of *horses*, a hard tumor or swelling in or near a joint, particularly in the hock, causing lameness. SPAV'INED a. *-ĭnd*, affected with spavin.—*Spavin* occurs under two different forms, both interfering with soundness. In young, weakly, overworked subjects, the hock-joint is sometimes distended with dark-colored thickened synovia or joint-oil: this is bog or blood spavin. Wet bandages, occasional friction, a laxative diet, and rest, should for several weeks be diligently tried; and if such remedies prove unsuccessful, the swelling must be dressed with strong blistering ointment, or fired. The second variety of S. is more common and serious. Toward the in

side of the hock, at the head of the shank-bone, or between some of the small bones of the hock, a bony enlargement may be seen and felt: this is bone-spavin. At first there is tenderness, heat, swelling, and considerable lameness; but as the inflammation in the bone and its investing membrane abates, the lameness is less perceptible, though the animal continues to drag his leg and go stiffly. In recent and slight cases, cold water should be applied continuously; but in serious cases, when the limb is swollen and tender, hot fomentations are best. For several days they must be perseveringly employed. When the limb is again cool and free from pain, an iodide of mercury or fly-blister should be applied, and the animal treated to a long rest.

SPAWN, n. *spawn* [Bav. *span;* Dut. *spenne,* milk drawn from the breast]: the eggs of fish or frogs when cast forth; the spores of fungi; any product or offspring, in contempt: V. to produce or deposit eggs, as fish; to bring forth or to issue, as offspring, in contempt. SPAWN'ING, imp. SPAWNED, pp. *spawnd.* SPAWN'ER, n. *-ér,* a female fish.

SPAY, n. *spā* [etym. doubt.]: a hart three years old.

SPAY, v. *spā* [Gael. *spoth;* Bret. *spaza,* to castrate: L. *spado;* Gr. *spadōn,* a eunuch]: to extirpate the ovaries of; to castrate—said of a female animal. SPAY'ING, imp. SPAYED, pp. *spād.*

SPEAK, v. *spēk* [AS. *sprecan, specan;* Ger. *sprechen;* Fris. *spreka,* to speak: Icel. *spekja,* speech]: to utter articulate sounds, applied to human beings; to make thoughts known by words; to talk; to converse with; to converse, or to be able to converse, in a language; to discourse; to make a speech; to address; to accost; to give sound; in *OE.,* to proclaim; to celebrate; to exhibit; to make known SPEAK'ING, imp.: N. act of uttering words; discourse. SPOKE, pt. *spōk.* SPOKEN, pp. *spō'kn.* SPEAKER, n. *spēk'-ér,* one who speaks. THE SPEAKER, chairman of some legislative bodies—usually national or state bodies (see below). SPEAK'ERSHIP, n. office of speaker. SPEAK'-ABLE, a. *-ă-bl,* that can be spoken; in *OE.,* having the power of speech. SPEAKING-TRUMPET, instr. resembling a trumpet, by which the sound of the human voice can be carried to a great distance. SPEAKING-TUBE, tube extending in any direction, through which conversation can be carried on between one apartment and another. TO SPEAK A SHIP, to hail or speak to, as the capt. or commander of one ship to another while their ships are passing near each other at sea.—SYN. of 'speak': to talk; discourse; articulate; say; tell; converse; pronounce; utter.

SPEAKER, The, presiding officer of the U. S. house of representatives and analogous legislative bodies in the United States and elsewhere.—In England the presiding officer not only of the house of commons but also of the lords is termed S.—In the U. S. house of representatives the S. is an official of very important and responsible functions: he is a member, elected by majority vote of the members in attendance. He presides over the deliberations, chooses the chairmen and members of the numerous committees of the house, supervises the journal, and signs all bills passed by the house, as well as all warrants, subpœnas, etc., issued by authority of the house. The S. of the U. S. house of representatives has the right, as member, to vote on all questions before the house; but ordinarily he does not exercise this right, except when his vote may be decisive. The rules of the house always provide that 'the S. shall not be required to vote in ordinary legislative proceedings, except where his vote would be decisive, or where the house is engaged in voting by ballot.' And as the S. has the right to vote, so he may take part in the debates; but then he calls a member to the chair while he steps down upon the floor of the house. In the British house of commons the S. may neither vote nor enter into the debate.—In the U. S. house of representatives the chair, in the absence of the S., is occupied by a member named by the speaker to be S., *pro tempore*, or, in default of action by the speaker, then named by the house. The S. is removable from office by vote of the house. In event of the death of the S., the house elects his successor; in case of his disability, the house may choose a S. *pro tempore* or may declare the chair vacant and elect a new speaker.

In the Eng. house of lords the lord chancellor is S. He may speak or vote on any question, and has no more authority than any other member of the house. In the house of commons the S. is a member elected to that office at the desire of the crown, and confirmed by the royal approbation given in the house of lords. A similar office seems to have existed as early as the reign of Henry III., when Peter de Montfort signed and sealed an answer of the parliament to Pope Alexander, *vice totius communitatis;* but the title S. was given first to Sir T. Hungerford in the reign of Edward III. The S. of the house of commons presides over the deliberations of the house, and enforces the rules for preserving order: he puts the question, and declares the determination of the house. As the representative of the house, he communicates its resolutions to others, and conveys its thanks or its censures. He is thus the mouth piece of the house, whence his title S. seems derived. He issues warrants in execution of the orders of the house for commitment of offenders, for issue of writs, attendance of witnesses, bringing up prisoners in custody, etc. The mace is borne before him by the serjeant-at-arms when he enters or leaves the house; when he is in the chair, the mace is left on the table, and it accompanies him on all state occasions. He cannot speak or vote

on any question, but on an equality of voices he has a casting-vote. Both by ancient custom and legislative declaration, he is entitled to take precedence of all commoners.

SPEAK'ING: see READING AND SPEAKING.

SPEAKING-TRUMPET: instrument for giving concentration rather than dispersion to the waves of sound originated by the articulation of the human voice; thereby enabling the sound to be conveyed to a greater distance. It is of utmost use on shipboard in enabling the officers to convey orders during windy weather from one part of the deck to another, or to the rigging. Though some instrument of the kind appears to have been employed earlier in more than one part of the world, the S.-T. in its present form is a modern invention, whose origination is claimed for Athanasius Kricher (q.v.), and for Sir Samuel Morland, who (1670) submitted to the London Royal Soc. a communication on the best form for such an instrument

The theory of the action of the S.-T. has never been thoroughly explained; but it is supposed that the sides of the tube throw the sound back and back in various reflections, until ultimately the waves quit the instrument in parallel lines. It does not seem to depend on vibration of the instrument.

SPEAR, n. *spēr* [Dan. *spær;* Dut. and Ger. *speer*, a spear, a lance: L. *sparus*, a hunting-spear]: sharp-pointed weapon, variously shaped, with a long (usually wooden) shaft—for thrusting or for throwing, also for receiving and repelling an assault (see JAVELIN: LANCE: PIKE): V. to pierce or kill with a spear. SPEAR'ING, imp. SPEARED, pp. *spērd*. SPEAR-HEAD, the bone, stone, or metallic point of a spear. SPEAR'MAN, n. a man armed with a spear. SPEAR-GRASS, any long stiff grass. SPEAR'MINT, n. *-mĭnt*, plant, species of mint having spear-shaped leaves (see MINT). SPEAR'WORT, n. *-wŏrt*, certain species of *Ranunculus*, *R. lingua* and *R. flammŭla*.

SPEAR, *spēr*, SAMUEL P.: 1815–1875, May 5; b. Boston: soldier. He entered the U. S. army 1833; served in the Seminole Indian war in Fla.; and through the Mexican war, in which he was wounded at Cerro Gordo; took part in several campaigns against hostile Indians on the plains, and in the Utah expedition; entered the Union army as lieut.col. 11th Penn. cav. 1861; was elected col. 1862; distinguished himself on scouting expeditions in the civil war; was severely wounded at Five Forks; was promoted brig.gen. and brevetted maj.gen.; resigned 1865, May 9; and died from the effects of his service.

SPEAR, *spēr*, SAMUEL THAYER, D.D., LL.D.: 1812, Mar. 4—1891, Mar. 31; b. Ballston Spa, N. Y.: Presb clergyman. He graduated at the New York Coll. of Physicians and Surgeons 1833, but abandoned medicine for theology, which he studied with Dr. S. S. Beaman at Troy, N. Y.; was pastor of the 2d Presb. Church, Lansingburg, 1836–43, and afterward of the South Presb. Church, Brooklyn; resigning 1871 to take an editorial position on the New York *Independent*, having charge of constitutional, finan

cial, and, for a time, political subjects; and was a frequent contributor of articles on other topics. He published: *Family Power* (1846); *Religion and State* (1876); *Constitutionality of Legal-Tender Acts* (1877); *The Law of the Federal Judiciary* (1883); *The Law of Extradition* (1884), *The Bible Heaven;* also volumes of sermons and essays. He was regarded as an authority on such legal subjects as those in his published volumes. As preacher and pastor he was highly successful; and as a clear, incisive debater, he had much influence in ecclesiastical assemblies.

SPEAR'-FOOT, of a Horse: the right hind-foot.

SPEC, n. *spĕk:* in *slang*, for SPECULATION.

SPECIAL, a. *spĕsh'ăl* [F. *spécial*—from L. *specĭālis*, belonging to a particular sort or kind, not general—from *specĭēs*, a particular sort: It. *speciale*]: pertaining to a species or sort; particular; designed for a particular purpose; confined to some particular department or subject; extraordinary; uncommon; in *OE.*, chief in excellence. SPE'CIALIZE, v. *-īz*, to particularize; to determine in a special manner. SPE'CIALIZING, imp. SPE'CIALIZED, pp. *-īzd.* SPE'CIALIZA'TION, n. *-ī-zā'shŭn*, the act of making special; special determination. SPE'CIALLY, ad. *-lĭ*, in a special manner, particularly above others. SPE'CIAL'ITY, n. *-ĭ-ăl'ĭ-tĭ* [F. *spécialité*—from L.]: the special or particular mark of a person or thing; an object of special attention. SPE'CIALTY, n. *-ăl-tĭ*, a particular case; an obligation or bond; that for which a person is distinguished. SPECIAL CASE, or CASE STATED, in *law*, statement, in compendious form, of the facts on which any question of law or equity arises, which is drawn up by mutual agreement of the parties at any stage of the suit or even at the beginning, and submitted to the court for its decision as to the proper application of the law or the proper legal inference from the facts. SPECIAL CONSTABLE, one appointed for a particular occasion. SPECIAL JURY (see below). SPECIAL LICENSE, in the Eng. marriage law, a license given by the Abp. of Canterbury authorizing a priest to solemnize a marriage without publication of bans, and at a time and church other than those required in ordinary cases: it is a continuance to the abp., from the time of Henry VIII., of the right in such cases held previously by the pope. SPECIAL PLEADER, in *law*, one who draws common-law pleadings: see under PLEA. SPECIAL PLEADINGS, in *law*, special or new matter; the whole science of pleading: in general, the specious but unsound arguments of one whose object is victory and not truth. SPECIAL VERDICT, in *law*, a finding of the naked facts of the case by a jury, leaving to the court the application of the law to them.—SYN. of 'special': appropriate; peculiar; specific; particular; distinctive.

SPE'CIAL JU'RY: jury selected with the assistance of the parties to a suit at law: for a S. J. in the United States, see JURY.—In Eng. law, a S. J. consists of a superior class of men, e.g., esquires, or men of higher degree, bankers, merchants, etc., selected by the sheriff and formed into a separate list. The advantage of a S. J. is that the jurors are less liable to be carried away with prejudices, and more intelligent, and able to understand difficult cases.

SPE'CIALTY DEBT: debt constituted by deed under seal, as a bond, which in the event of the debtor's death formerly had, in English law, a right of prior payment over Simple Contract (q.v.) debts. This preference was abolished 1870, except when a lien or other security is held for the debt. In the United States, a specialty may be definitive evidence of a debt, but it does not *per se* give the debt any priority.

SPECIE, n. *spē'shĭ* or *spē'sh'ā* [from *specie*, which see, as if paid *in specie* = paid in visible coin]: gold and silver coin, as distinguished from paper money or bank notes.

SPE'CIE PAYMENT, RESUMPTION OF: by the treasury of the United States, 1879, Jan. 1. The New York banks having suspended specie payments 1861, Dec. 30, the U. S. treasury immediately found itself compelled to do likewise: thus began the period of suspension of specie payments in the United States, which continued 18 years. The first practical step toward resumption was taken 1865, when congress authorized the sec. of the treasury to withdraw monthly $4,000,000 of treasury notes; but this process ceased within two years. Not till 1875 was the law enacted which formally authorized resumption of specie payments, and that law deferred the time of resuming to 1879. The mode of providing for resumption was to withdraw $80 of the U. S. legal-tender notes for every $100 of national bank-notes issued, until the sum of the outstanding legal-tenders should be reduced to $300,000,000; and to accumulate the gold coming from customs duties and sale of bonds. In this way a sufficient amount of coin was accumulated to meet any demand when the day set for resumption (1879, Jan. 1) arrived; and the change was made without the least injury to any of the financial and commercial interests of the country, although it had in advance been stigmatized as either impracticable or ruinous by some financial authorities. The year of resumption was marked by almost unexampled commercial prosperity in the United States: the imports were $270,000,000 less than the exports; the crops, too, were unusually bountiful. As a consequence, the prices of merchandise and securities of all kinds advanced rapidly, and a state of buoyancy, activity, and speculation ensued.—See DEBT, NATIONAL: CURRENCY.

SPECIES, n. *spē'shēz* [L. *speciēs*, a particular sort—from *speciō*, I look at, I behold: It. *specie*, sort, appearance]: a sort; a kind; a race; group of individuals or objects sufficiently identical in all their natural qualities to justify the conclusion that they may have sprung from a common stock; a collection of like individuals produced by other individuals equally like them; a rank subordinate to a *genus* (see below): group of individuals agreeing in common attributes, and designated by a common name; in *med.*, the component part of a compound medicine.

SPE'CIES, in Natural History: term designating groups inferior to genera (see GENUS), but superior to varieties (see VARIETY). In mineralogy, the term is of different application, serving the purpose of classification; distinguishing only analagous composition and a like system of crystallization, it admits of one element replacing another, and includes minerals of very different appearance and physical properties. In organic nature, it has usually been regarded as possessing a higher and more definite signification. But no term is more difficult to define. Many definitions have been proposed, but none wholly satisfactory; every attempt at definition involving more or less the adoption of some disputed theory. If, e.g., a S. is regarded as including all the beings which have descended from parents created with the essential characters now belonging to the S., not only is the original creation in that particular form taken for granted, but likewise the impossibility of changes in nature, which some most eminent naturalists regard as actually taking place, and the belief of which implies no doubt of the act of creation itself, but only a certain opinion as to some of the laws by which organic nature is governed. To regard S. as mere indeterminate and fluctuating groups, capable of indefinite modification in the lapse of ages, is equally to adopt a theory. If a S. is defined as containing all the individuals capable of intermingling without consequent sterility of progeny, other difficult questions must be decided before the definition can be adopted as to any classes of creatures; while to many kinds it seems incapable of application, and much that is merely theoretical is involved in it.

Naturalists have very generally regarded S. as unchanging throughout an indefinite succession of generations, except within narrow and marked limits; and have adopted substantially the definition of Buffon: 'A *species* is a constant succession of individuals similar to and capable of reproducing each other.' Thus De Candolle, eminent botanist, says: 'We unite under the designation of a *species* all those individuals that mutually bear to each other so close a resemblance as to allow our supposing that they may have proceeded originally from a single being or a single pair.' And Cuvier, great zoologist, describes a S. as 'a succession of individuals which reproduces and perpetuates itself.'

Here it is to be remarked, that even if the permanence of S. implied in these definitions were ascertained, and their original creation in their present form admitted as unquestionable, it would by no means follow that we must suppose every S. to have proceeded from a single individual or a single pair. Nor, accepting the biblical statement concerning the human race, that all mankind are the offspring of a single pair, are we entitled to infer that the same has been the case also as to all animals and plants capable of freely intermingling, and which, therefore, are commonly regarded as forming one species.

But the separate creation and immutability of S. are disputed, the large majority of naturalists maintaining that S. undergo modification, and that existing forms of life have descended by true generation from pre-existing forms. Lamarck was the first to proclaim this doctrine, at least so as to attract much attention, about the beginning of the 19th c. He held that all S., even including man, are descended from S. of inferior organization; while to account for the existence of very simple forms at the present day, he had recourse to the supposition of their spontaneous generation. He was followed, with greater caution, by Geoffroy Saint-Hilaire, who regarded what we call S. as various degenerations of the same type, but did not believe that the existing S. are now in process of modification. Similar views have since been stated by many authors; but the works which have most strongly directed attention to them, and in which they have been most fully advocated, are *Vestiges of the Natural History of Creation* (first published anonymously 1844, but acknowledged in the 12th ed., 1884, to be by Dr. Robert Chambers, q.v.); and, above all, Darwin's work *On the Origin of Species by Means of Natural Selection* (1859).

It is impossible for us to do more than briefly exhibit the principal arguments on this question. Lamarck rested much on the well-known effect of use or exercise in strengthening and enlarging an organ, and of disuse in atrophying it. 'He conceived that, an animal being brought into new circumstances, and called upon to accommodate itself to these, the exertions which it consequently made to that effect caused the rise of new parts; on the contrary, when new circumstances left certain existing parts unused, these parts gradually ceased to exist. Something analogous was, he thought, produced in vegetables, by changes in their nutrition, in their absorption and transpiration, and in the quantity of caloric, light, air, and moisture which they received. This principle, with time, he deemed sufficient for the advance from the monad to the mammal.' The author of the *Vestiges*, from whom this account of Lamarck's views is taken, regards him as in error 'in giving this adaptive principle too much to do;' and says: 'In the present day, we have superior light from geology and physiology, and hence comes the suggestion of a process

analogous to ordinary gestation for advancing organic life through its grades, in the course of a long but definite space of time, with only a recourse to external conditions as a means of producing the exterior characters.' The author of the *Vestiges* designates the principle for which he contends as that of *Progressive Development*, and states it as follows: 'The proposition determined on, after much consideration, is, that the several series of animated beings, from the simplest and oldest up to the highest and most recent, are, under the providence of God, the results, *first*, of an impulse which has been imparted to the forms of life, advancing them in definite times, by generation, through grades of organization terminating in the highest dicotyledons and vertebrata, these grades being few in number, and generally marked by intervals of organic character which we find to be a practical difficulty in ascertaining affinities; *second*, of another impulse connected with the vital forces tending, in the course of generations, to modify organic structures in accordance with external circumstances, as food, the nature of the habitat, and the meteoric agencies, these being the "adaptations" of the natural theologian.' He further regards the *nucleated vesicle* as 'the fundamental form of all organization, the meeting-point between the inorganic and the organic,' and as 'the starting-point of the fetal progress of every higher individual in creation, both animal and vegetable.' Founding on instances of the production of the *proximate principles* of which organic substances are composed in the laboratory of the chemist, he goes on to say that 'an operation which would produce in these the nucleated vesicle is all that is wanting effectually to bridge over the space between the inorganic and the organic;' and that 'it does not seem, after all, a very immoderate hypothesis, that *a chemico-electric operation, by which germinal vesicles were produced*, was the first phenomenon in organic creation, and that the second was *an advance of these through a succession of higher grades, and a variety of modifications*, in accordance with laws of the same absolute nature as those by which the Almighty rules the physical department of nature.' He regards the idea of S. or specific distinction, therefore, 'as *merely applicable to certain appearances presented, perhaps transiently, to our notice.*' He adduces instances of great changes of form and character known to take place in the lower departments of nature, both animal and vegetable, as giving probability to the supposition that in a long succession of generations great changes may take place also in the higher.

The whole theory of the author of the *Vestiges* as to organic nature has been exposed to objection in consequence of its connection with views of the general system of the universe altogether foreign to the present subject; and because of an evident inclination to the belief in a transition from inorganic to organic existence by chemico-electric operation. The argument is weak-

oned also by the too ready acceptance of unsubstantial facts, as of the transmutation of one kind of grain into another; and by resting too much on what may be reckoned the mere mistakes of naturalists, as to the forms of the lower kinds of plants and animals, of which genera and even tribes have been constituted, that have afterward been found mere modifications or larval stages of creatures very different in their most apparent characters. Some chief arguments of the *Vestiges* are, however, used by Darwin, though with great scientific caution.

Darwin's views are distinguished from those of all his predecessors by the introduction of what he designates the principle of *Natural Selection* (see DARWINIAN THEORY). It is to be noted, however, that the theory of Natural Selection was arrived at independently by Alfred Russel WALLACE (q.v.). Darwin maintains the variability of S.; and adduces much evidence to show that variation is continually taking place, in consequence of the external conditions to which plants and animals are subjected. He rests much on the difficulty of distinguishing between varieties and S., and on the changes known to result from cultivation and domestication. He dwells on the *selection* which man makes, in order to produce new breeds or varieties, and supposes a similar 'selection' to take place in nature, in the *struggle for life*, which all plants and animals must undergo. This *struggle for life* is, in fact, the foundation of his theory. He shows that every kind of plant or animal must struggle, and in order to its continued existence must be successful in its struggle, not only against those other creatures which seek to make it their food, but still more in competition with those which seek the same nutriment with itself. In this struggle, the stronger, or those which possess anything peculiarly favorable in their organization, must overcome the weaker, and the weaker must therefore cease to exist. Thus a slight variation, such as often takes place may be perpetuated; and the possessors of any advantage in the means of procuring food, or in the powers of offense or defense, may entirely displace their less favored congeners. The modifications thus taking place Darwin regards as accounting for the changes in organized beings from one geologic period to another, and for the great differences in the plants and animals of different parts of the world. In support of his views, he argues from the tendency to variation seen in cultivated plants and domestic animals, and the perpetuation of the forms so produced in breeds and races; and from the fact that the variations in cultivated and domestic S. are in some cases greater than those which are regarded as affording grounds of specific, sometimes even of generic or greater distinctions in a state of nature. 'Can it be thought improbable,' he says, 'seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being

in the great and complex battle of life, should sometimes occur in the course of thousands of generations? If such do occur, can we doubt—remembering that many more individuals are born than can possibly survive—that individuals having any advantage, however slight, over others, would have the best chance of surviving and of procreating their kind? On the other hand, we may feel sure that any variation in the least degree injurious would be rigidly destroyed. This preservation of favorable variations, and the rejection of unfavorable variations, I call *Natural Selection.* Variations neither useful nor injurious would not be affected by natural selection, and would be left a fluctuating element, as perhaps we see in the S. called polymorphic.' He further supports these views by pointing out the favorable opportunity for the operation of natural selection afforded in a country undergoing great physical changes, as of climate; and particularly in an island, or a country surrounded by barriers sufficient to prevent the ready immigration of S. 'In such cases,' he says, 'every slight modification, which in the course of ages chanced to arise, and which in any way favored the individuals of any of the S. by better adapting them to their altered conditions, would tend to be preserved; and natural selection would thus have free scope for the work of improvement.'

Darwin supposes new variations to be continually taking place, but the greater number of these speedily to become extinct; while others, becoming perpetuated, and perhaps causing the extinction of the original forms, give rise to other forms, until some of them have so widely diverged that all traces of their common origin are lost. He does not, however, commit himself to the opinion that all forms of organic life, or even all plants, or all animals, have a common origin. He completely rejects Lamarck's notion that new and simple forms are continually being produced by spontaneous generation. 'I need hardly say,' he remarks, 'that science in her present state does not countenance the belief that living creatures are now ever produced from inorganic matter,' and he accounts for the existence of low forms of life by saying that 'natural selection includes no necessary and universal law of advancement or development; it only takes advantage of such variations as arise and are beneficial to each creature under its complex relations of life.' So that even the lowest forms might 'be left by natural selection unimproved, or but little improved,' as geology tells us of infusoria and rhizopods, which have remained for an enormous period in nearly their present state.

That S. differ not only in single characters, but in many, Darwin accounts for by reference to unknown laws of the correlation of organs—laws, however, which, though unknown, we know to exist, so that a modification of one organ is attended with modification of other organs, as is exemplified in our domestic breeds: thus.

hoofs, hair, and teeth show associated variations. It is known, e.g., that an abnormal development of *hair* (as in the Russian peasant, known as the dog-man, *homme-chien)* is often accompanied by arrest of development of the teeth.

In further support of the theory of natural selection, the fact is insisted on, 'that it is the common, the widely diffused, and widely ranging S. belonging to the larger genera within each class, which vary most.' That the several subordinate groups in any class of creatures 'cannot be ranked in a single file, but seem rather to be clustered round points, and these round other points, and so on in almost endless cycles,' Darwin thinks incapable of explanation, except on the supposition of community of origin and natural selection. He points also to the analogous manner in which S. of the same genus vary, as corroborative of his views. He accounts for the absence or rarity of transitional varieties by supposing the predominant forms to have taken possession of their districts, while these were in process of being stocked; and that since these districts differ much in their natural characters, the forms originating in the comparatively unextensive intermediate tracts have not been able to contend against them, and have become extinct. He points out the possibility that areas now continuous may not have been so during a long period, and that species may have been formed while they were in the condition of islands. But this remains one of the difficulties.

He ascribes to natural selection the results which Lamarck ascribed to use and disuse, in the development and atrophy of organs; and thinks it possible that the flying squirrels may thus have had a common origin with the true squirrels, and the *Galeopithecus* with the lemurs; though he admits that we have no graduated links of structure connecting them. 'Nor can I see any insuperable difficulty,' he says, 'in further believing that the membrane-connected fingers and forearm of the *Galeopithecus* might be greatly lengthened by natural selection; and this, as far as the organs of flight are concerned, would convert it into a bat.' Like Lamarck and the author of the *Vestiges*, Darwin rests not a little on the unity of type throughout whole classes of creatures, and the homologies of parts very different from each other, as in the four-limbed structure of the vertebrata generally, and even the articulations of the limbs. He endeavors to trace the eye from its simplest to its most perfect form, and shows how gradual are the transitions found on comparison of existing creatures, from the one to the other. He goes even further, and says: 'Several facts make me suspect that nerves sensitive to touch may be rendered sensitive to light, and likewise to those coarser vibrations of the air which produce sound.'

He dwells at great length on the subject of hybridism, and the general sterility of hybrids, endeavoring to show

that it presents no insuperable objection to the theory of a gradual modification of S., their sterility being incidental on other differences, and sterility occurring, as he labors to prove, when varieties are crossed, as well as in the hybrids of distinct S. The difficulties presented by geology he obviates very much by insisting on the imperfection of the geological record. He does not adopt the view of the author of the *Vestiges*, that the geological record exhibits to us a succession of animals corresponding in their progressive development with the fetal development of the mammalian embryo. But he founds an argument on the many connecting links in the general system of nature which fossils supply when compared with existing S. And he endeavors to show that his theory is perfectly consistent with the known facts of the geographical distribution of S.; in particular with the remarkable facts of the peculiarity of the fauna and flora of some lonely oceanic islands, and of the frequent occurrence of the same S., both in cold regions comparatively near the pole, and on mountains far remote from each other in lower latitudes—referring the latter class of facts to former geologic periods, when the continental areas were not the same as now, or when the prevailing climatic conditions were very different. And he finds support for his views in the correspondence, without identity, of the floras and faunas of the n. parts of America and of the old world.

It is but a very imperfect sketch which we have thus been able to give of Darwin's theory, and of the arguments by which it is supported. Whatever may be thought of the truth of the theory, it must be admitted to be admirably framed and guarded, and to be maintained not only with great ingenuity of argument, but by the aid of a vast store of scientific information, most skilfully used. Its opponents condemn it as resting on unwarrantable assumptions, and demand some proof, e.g., of the transition of organs from a simple or rudimentary to a complex and approximately perfect state. They also refuse to acknowledge such imperfection of the geological record as Darwin's argument demands, and they insist much on the completeness of the changes which that record discloses, and the absence of transitional forms both among fossils and existing species. This objection may probably be deemed weak and inapt; inasmuch as even if the absence of transitional forms, or 'links,' were a fact pertaining to the present stage of discovery, it would be mere conjecture to assume it as a fact pertaining also to further scientific exploration. This whole class of objections to the Darwinian theory follows that theory itself into the wide field of conjecture—adopting the method of assuming that because a certain thing 'may' have occurred, and cannot now be shown not to have occurred, and can be shown to be even probable in some points of view, therefore that very thing occurred; such occurrence being then taken as the basis of a wide-reaching theory of the

universe. In any event, this objection of the absence of transitional forms has met what is claimed by evolutionists as a triumphant refutation by the discovery of a long series of fossil 'horses' ranging through about 45 'species' from a 5-toed ancestral form to the one-toed form of to-day: see HORSE, FOSSIL. 'The successive forms of the equine type,' writes Prof. Huxley, 'have been fully worked out; while those of nearly all the other existing types of ungulate mammals and of the *Carnivora* have been nearly as closely followed through the Tertiary deposits; the gradations between birds and reptiles have been traced, and the modifications undergone by the *Crocodilia*, from the Triassic epoch to the present day, have been demonstrated' (see SAUROPSIDA).

Much of what Darwin and ther advocates of the same general views contend for, his opponents admit; a certain power of development in organic nature, a 'struggle for life,' and a degree of 'natural selection;' but they regard the limits of development and variation as comparatively narrow. Nor would the state of the question, as they believe, be materially affected, if many of what have hitherto generally been regarded as species, should be proved to be mere varieties. Any number of such errors of naturalists might be exposed and corrected, without modification of our views of the laws of nature; and errors of this kind are precisely such as might be expected, when the forms of organic life began to be discovered and described, and ere yet there was time for their mature study in all parts of the world, and under all various circumstances.

The hypothesis of Darwin is spoken of often as the *evolution theory*. But it must be remembered that it is not the only theory of evolution; Darwin's fundamental idea being that of evolution by *natural selection* —'survival of the fittest,' as Herbert Spencer expresses it. Evolutionism has made remarkable progress during recent years. Scarcely a living naturalist now entirely rejects it, and the vast majority indeed are earnestly occupied in its elucidation and application. The theory too is being extensively applied in sociology and philosophy.—See DARWIN; DARWINIAN THEORY; ZOOLOGY; MAMMALIA; DESCENT OF MAN; DEVELOPMENT OF THE EMBRYO; EVOLVE (EVOLUTION): also ANTHROPOLOGY; COSMOGONY.—See also Darwin's *Origin of Species*, *Descent of Man*, and other works; Lyell's *Principles of Geology;* Huxley's *American Addresses* and *Science and Culture;* Haeckel's *Natural History of Creation*, etc.

SPECIFIC GRAVITY.

SPECIF'IC GRAV'ITY: the proportion which the weight of a certain bulk of a given body bears to the same bulk of another body taken as a standard. The standard for substances solid and liquid is distilled water at the temperature of 62° F., barometer 30 inches; and the weight of a cubic inch of this standard is 252·45 grains; hence a cubic ft. of it weighs 997·129 oz., or 62·32 lbs. It is convenient to remember that a cubic ft. of water weighs about 1,000 oz. avoirdupois, as the error resulting from employing this estimate amounts to little more than $\frac{1}{350}$ of the whole. For aeriform bodies, the standard is atmospheric air, 100 cubic in. of which, at a temperature of 60° F. and 30 in. barometer, weighs 30 935 grains; and a cubic ft. of air weighs 536·96 grains, which is $\frac{1}{816}$ of the weight of the cubic ft. of water at the same temperature. The S. G. of solid bodies is measured best by the hydrostatic balance (see ARCHIMEDES, PRINCIPLE OF), which gives the weight of a volume of water equal in bulk to the solid, by which it is only necessary to divide the weight of the solid in air to obtain the S. G.; that of liquids may be obtained by the Areometer (q.v.), or by comparing the weight lost by a solid body in the liquid and in water, and dividing the former by the latter—or by means of the *specific-gravity bottle*, which holds exactly 1,000 grains of distilled water in its standard condition. The bottle is emptied of water, filled with the liquid, and then weighed; the result gives the weight of a volume of the fluid equal in bulk to 1,000 grains of the standard, and hence this weight divided by 1,000 gives the S. G. The S. G. of an aeriform fluid is determined by weighing a glass globe filled first with the fluid and then with atmospheric air. Annexed is a table of the S. G. of a few of the more common substances.

SOLIDS (METALS),

	Sp. Gr.		Sp. Gr.
Iridium (hammered)	21·15	Iron	7·80
Platinum	21·50	Tin	7·30
Gold	19·50	Zinc	6·80—7·80
Mercury	13·59	Antimony	6·80
Lead	11·45	Arsenic	5·70—5·90
Silver	10·50	Aluminium	2·67
Bismuth	9·82	Calcium	1·58
Cobalt	8·50	Sodium	·97
Copper	8·95	Potassium	·86
Manganese	7·13		

OTHER SOLIDS.

	Sp. Gr.		Sp. Gr.
Loadstone	4·93	Honey	1·45
Ruby	4·28	Lignum vitæ	1·33
Topaz	4·03	Coal	1·16
Diamond	3·52	Amber	1·08
Limestone	2·70	Spanish Mahogany	1·06
Chalk	2·45	English Oak	·97
Glass, Flint	2·90	Butter	·94
Granite	2·78	Ice	·93
Flint	2·58	Human Body, alive	·89
Clay	2·16	Ash	·84
Ivory	1·92	Elm	·67
Bone	1·66	Poplar	·38
Sand	1·50	Cork	·24

LIQUIDS.

	Sp. Gr.		Sp. Gr.
Sulphuric Acid	1.84	Champagne Wine	1·00
Nitric Acid	1·50	Burgundy Wine	·99
Aqua Regia	1·23	Whisky, average	·92
Blood	1·04	Oil of Turpentine	·87
Oil of Cinnamon	1·04	Brandy	·84
Oil of Cloves	1·03	Alcohol, pure	·80
Milk	1·03	Ether, Sulphuric	·72
Tar	1·01		

GASES.

	Sp. Gr.		Sp. Gr.
Hydriodic Acid	4·37	Oxygen	1·10
Chlorine	2·45	Olefiant Gas	·98
Sulphurous Acid	2·21	Nitrogen	·97
Cyanogen	1·80	Prussic Acid	·94
Carbonic Acid	1·52	Ammonia	·59
Muriatic Acid	1·28	Hydrogen	·07

SPECIFIC, SPECIFICATION: see under SPECIFY.

SPECIFY, v. *spĕs'ĭ-fī* [F. *spécifier*—from mid. L. *specĭfĭcārĕ*, to describe, to portray—from L. *speciēs*, a particular sort; *facĭō*, I make: It. *specificare*, to specify]: to mention or name in words; to designate so as to distinguish from every other; to determine by a particular mark or limit. SPEC'IFYING, imp. SPEC'IFIED, pp. *-fīd*. SPECIFIC, a. *spĕ-sĭf'ĭk*, or SPECIF'ICAL, a. *-ĭ kăl*, that designates the species, or constitutes it; definite or particular; effectual, as a remedy. SPECIFIC, n. a remedy which acts effectually in particular diseases; that which is peculiar to a thing. SPECIF'ICALLY, ad. *-lĭ*. SPECIFICATION, n. *spĕs'ĭ-fĭ-kā'shŭn* [F.—L.]: act of specifying; a designation or statement of particulars; particular mention; a written enumeration of the particulars of a contract, etc. SPECIFIC CENTRE, in *nat hist.*, a term used to express that single point upon which each species had its origin, and from which its individuals became diffused (see SPECIES: ETC.). SPECIFIC CHARACTER, circumstances distinguishing one species from every other species of the same genus (see SPECIES: ETC.). SPECIFIC GRAVITY, ratio which the weight of any substance bears to the weight of an equal bulk of pure water—in the case of *gases* the standard is not water, but hydrogen (see below). SPECIFIC HEAT, ratio which the amount of heat required to raise a definite mass of a substance to any temperature bears to the amount required to raise an equal mass of water to the same temperature (see HEAT). SPECIFIC LEGACY (see LEGACY). SPECIFIC NAME, the name which, appended to the name of the genus, constitutes the distinctive name of the Species (q.v.). SPECIFIC PERFORMANCE, actual performance of a contract according to the letter—enforced by a court of equity in cases when the remedy at law—viz. recovery of damages—is manifestly inadequate.

SPECIMEN, n. *spĕs'ĭ-mĕn* [L. *specĭmen*, an example—from *specĭō*, I look at]: a part exhibited in order that the nature and quality of the body or substance may be known; a sample; an instance.—SYN.: example; pattern; model; sample; instance; exemplification; copy; illustration; case.

SPECIOUS, a. *spē'shŭs* [L. *specĭōsus*, full of beauty, handsome—from *specĭēs*, show, appearance—from *specĭō*, I look at: It. *specioso:* F. *spécieux*]: showy; plausible; apparently right; appearing well at first view. SPE'CIOUSLY, ad. *-lĭ.* SPE'CIOUSNESS, n. *-nĕs*, the quality of being specious; plausible appearance; fair external show.—SYN. of 'specious': ostensible; colorable; plausible; feasible; showy.

SPECK, n. *spĕk* [Lith. *spakas*, a speck: Swiss, *speckig*, dirty; O. Dut. *spickelen*, to speckle: Ger. *spucken;* O. Dut. *spicken*, to spit]: a stain; a spot; a blemish; a flaw; anything very small: V. to stain in spots or drops; to mottle. SPECK'ING, imp. SPECKED, pp. *spĕkt.* SPECKLE, n. *spĕk'kl* [dim. of *speck*]: a small speck; a spot or stain of a color different from that of the object: V. to mark with small spots of a different color. SPEC'KLING, imp. *-kling.* SPEC'KLED, pp. *-kld:* ADJ. marked with speckles; variegated with spots of a color different from that of the object. SPEC'KLEDNESS, n. *-kld-nĕs*, the state of being speckled.

SPECTACLE, n. *spĕk'tă-kl* [F. *spectacle*—from L. *spectac'ŭlum*, a spectacle—from *specto*, I look at, I behold; *specĕrĕ*, to see]: something exhibited to view, as a thing unusual; anything perceived by the sight; a sight; a pageant; a gazing-stock. SPEC'TACLES, n. plu. *-tă-klz*, glasses mounted on a light frame to assist or correct vision (see below). SPEC'TACLED, a. *-tă-kld*, furnished with spectacles. SPECTACULAR, a. *spĕk-tăk'ū-lĕr*, of or relating to shows. SPECTAC'ULARLY, ad. *-lĭ.*—SYN. of 'spectacle': show; pageant; sight; exhibition; representation.

SPEC'TACLES: lenses, usually of glass, framed for convenient application to the eyes to aid or to correct vision; an invention of the 13th c., attributed by some to Alexander di Spina, a Florentine monk; by others to Roger Bacon. At first, both the lenses and the frames were exceedingly clumsy: about the beginning of the 19th c., light metal frames were introduced, instead of the cumbrous horn or tortoise-shell mountings still occasionally seen, and known as goggles. S. of exquisite workmanship are now produced, which, with their lenses complete, are a quarter of an ounce in weight. Steel frames have displaced gold, silver, and all other materials, when comfort and effectiveness are preferred. The lenses should be of the best optical glass, which, as a rule, is superior to Brazilian pebble or rock-crystal.—See SIGHT, DEFECTS OF.

SPECTATOR, n. *spĕk-tā'tĕr* [L. *spectātor*, a beholder—from *specto*, I look at; *specĭō*, I behold: F. *spectateur*]: a looker on; an observer; a witness. SPECTA'TRESS, n. fem. *-trĕs*, a woman who looks on or at. SPECTA'TORSHIP, n. in *OE.*, the act of beholding; the office or quality of a spectator.

SPECTRE, n. *spĕk'tĕr* [F. *spectre*—from L. *spectrum*, an appearance, an apparition—from *speciō*, I look at]: the imaginary appearance of a person who is dead; a ghost; an apparition; in *zool.*, a species of lemur, so named from its nocturnal habits and attenuated skeleton like body. SPEC'TRAL, a. *-trăl*, pertaining to a spectre; ghostly. SPECTROL'OGY, n. *-trŏl'ŏ-jĭ* [Gr. *logos*, a discourse]: science of chemical analysis by means of the spectra of different elements (see below—SPECTROSCOPE: SPECTRUM). SPECTROSCOPE, n. *spĕk'trō-skōp* [Gr. *skopĕō*, I view]: one of the most important instrs. of modern scientific research, in which the analysis of light coming from various bodies as light sources is conducted by means of prisms, the object being to determine, from the position of the spectral lines, the composition of the bodies (see below). SPECTROS'COPY, n. *-trŏs'kŏ-pĭ* [Gr. *skopĕō*, I view]: science of determining by analysis of light through the spectroscope the constituent elements of the body whence the light comes. SPEC'TRUM, n. *-trŭm*, plu. SPEC'TRA, *-tră* [L. *spectrum*, appearance, image]: the image of something seen after the eyes have been closed; the figure of the prismatic colors formed in a darkened chamber by permitting a ray of sunlight to pass into it through a prism—a *spectrum* may be formed by a ray from any luminous body, as from a star, a planet, etc., or from any body in a state of incandescence (see SPECTRUM, below). SOLAR SPECTRUM, spectrum formed by solar light, especially as thrown by a prism on a screen in a darkened room. SPECTRUM ANALYSIS (less properly, SPECTRAL ANALYSIS), act or art of ascertaining the character and composition of luminous bodies, by causing a ray of light from the body to pass through a prism, each substance in the spectrum having its own characteristic system of lines (see below—SPECTROSCOPE: SPECTRUM).

SPEC'TRE BAT (*Phyllostoma*): genus of bats having two membranous crests on the nose, one leaf-like, the other in the form of a horseshoe—giving their face that peculiar appearance from which they derive their name. The species are numerous, natives of the W. Indies and S. America.

SPECTROPHONE, *spĕk'trō-fōn* [L. *spectrum*; Gr. *phonē*, sound]; instrument for studying spectra (see SPECTRUM) by means of audible vibrations produced in a telephone receiver. Its essential parts are a Spectroscope (q.v.) minus the eye-piece, an opaque diaphragm containing a slit, and a hearing-tube, connected with the body, made to vibrate by the spectrum. Having discovered the principle of the Photophone (q.v.) and found that intermittent or variable rays of light cause vibrations in all bodies, Alexander Graham Bell, in further researches, repeated an experiment by Mercadier on the audible effects of the different parts of a spectrum. Mercadier had transmitted through a prism an intermittent beam from an electric lamp, and noted a difference in the audible effects in the several parts of the resulting spectrum. In Bell's experiment, 'sounds were obtained in every part of the visible spectrum, excepting the extreme half of the violet, as well as

in the ultra-red. A continuous increase in the loudness of the sound was observed on removing the receiver gradually into the ultra-red. The point of maximum sound lay very far out in the ultra-red. Beyond this point the sound began to decrease, and then stopped suddenly.' Some substances, when placed in the receiver, and passed from end to end of the spectrum, give the loudest sound in the green, others in the red, and so on; from this Bell inferred 'that the nature of the rays that produce sonorous effects in different substances depends on the nature of the substances that are exposed to the beam, and that the sounds are in every case due to those rays of the spectrum that are absorbed by the body.' The principle and *modus operandi* of the S. are described as follows by Prof. Bell: 'The eye-piece of a spectroscope is removed, and sensitive substances are placed in the focal point behind an opque diaphragm containing a slit. These substances are put in communication with the ear by means of a hearing-tube, and thus the instrument is converted into a veritable "spectrophone." Suppose we smoke the interior of our spectrophonic receiver and fill the cavity with peroxide of nitrogen gas. We have then a combination that gives us good sounds in all parts of the spectrum, visible and invisible, except the ultra-violet. Now pass a rapidly interrupted beam of light through some substance whose absorption spectrum is to be investigated, and bands of sound and silence are observed upon exploring the spectrum, the silent portions corresponding to the absorption bands.' Of the uses of the S., Bell says: 'Of course the ear cannot for one moment compete with the eye in the examination of the visible part of the spectrum; but in the invisible part beyond the red, where the eye is useless, the ear is invaluable. In working in this region of the spectrum, lamp-black alone may be used in the spectrophonic receiver. Indeed the sounds produced by this substance in the ultra-red are so well marked as to constitute the instrument a most reliable and convenient substitute for the thermopile.'

SPECTROSCOPE, *spĕk'trō-skōp:* instrument by aid of which spectral phenomena (see SPECTRUM) may be most conveniently studied. The *Prism S.* consists essentially of—(1) a tube having at one (closed) end a slit to admit the light to be analyzed, and at the other end a collimating lens whereby all the rays entering through the slit are collected into a parallel bundle; (2) a prism (in more complex spectroscopes there is a train of prisms) to refract and disperse the rays; (3) a small telescope, mounted behind the prism, to magnify and define the spectrum or image so obtained. Another tube contains a scale, which is illumined, and reflected from the surface of the prism into the telescope, thus determining the position of the lines under observation. The whole apparatus is arranged on a table, with means of adjusting the tubes at the proper angles with the prism. The object of multiplying prisms is to obtain greater dispersion.—The *Grating S.*, or *Diffraction S.*, is based on the principle of Diffraction (q.v.). See SPECTRUM: SUN.

SPECTRUM. *spĕk'trŭm:* in optics, the colored image of the sun or other luminous body, produced by Refraction through a Prism (q v.), by Diffraction (q.v.) through a fine grating, etc. This article relates only to the S. produced by a prism, both because that is commonly used, and because, so far as we have present occasion to examine it, it presents very nearly the same appearances as spectra produced by other processes.

The solar spectrum was carefully examined first by Newton, who deduced from his observations the composite nature of white light, and the different refrangibilities of its various colored constituents. A ray of sunlight enters a darkened room through a small hole, S, in a shutter. It

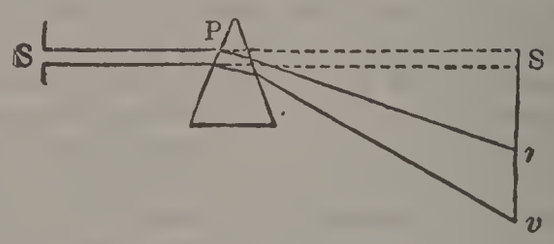


Fig. 1.

proceeds in a straight line to the opposite wall, and forms at S′, as a circular white spot, an image of the sun. If the edge of a glass prism, P, be interposed in the path of this ray, the white spot at S′ disappears, and the spectrum, *r*, *v*, is produced. In this form of experiment, its shape is that of a rectangle with semicircular ends, as figured below.

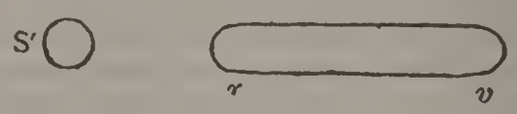


Fig. 2.

The breadth of the spectrum is equal to the diameter of the spot S′; and it is brilliantly colored, the end *r*, nearest to S′, being red, and the other end, *v*, violet. Between these we have gradations of color, and the whole appeared to Newton divisible into seven differently colored spaces, which he called red, orange, yellow, green, blue, indigo, violet. It is impossible, however, to settle precisely the exact boundary between any two of these fancied species of color; and, besides, such a description of the spectrum (though complete enough for popular language) is totally inadequate to express our present knowledge of the subject. In order to study the spectrum more closely, suppose we have pieces of colored glass each allowing only one definite color to pass. With a red glass placed at the hole in the shutter, the prism being removed, the effect would be to render the spot S′ red, without changing its position. Introduce the prism, and the effect is to change the position of the spot to *r*, without altering its size or color.

Similarly, with a violet glass we have a violet spot at *v*, and so on; the change of position, due to refraction, being least for red and greatest for violet. It thus appears that

the spectrum formed in this way, is made up of a series of circular spots, of the various colors of which white light consists, all of the same size and having their centres ranged along a line, so that each overlaps those next it. The only parts of the spectrum which are *pure*, i.e., where no two or more colors are mixed, are the ends: so

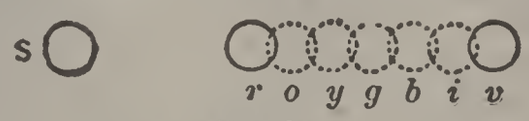


Fig. 3.

that, by this process, it is impossible to separate definitely the rays of different refrangibility, so as to see, for instance, *whether any are wanting*. How, then, are we to ascertain whether sunlight contains rays of every refrangibility from red to violet? The obvious method is to make the spot S′ not circular, but long and very narrow, a process mentioned by Newton himself. In such a case our figure would become

Fig. 4.

and, by making S′ narrow enough, we shall evidently be able to avoid overlapping of the various colored images, *unless there be present, in white light, rays of every refrangibility from red to violet.* To make this spot S′ thus narrow, a method commonly employed is to set the prism about halfway between the shutter and the screen, and to place before it a lens, such that, if the prism were removed, S′ would be an image of the hole in the shutter nearly equal to it in size. The hole must, therefore, be a narrow slit, parallel to the edge of the prism. When this arrangement is adjusted we have a pure spectrum, and we find it to be (at first sight) *continuous*. Thus, it appears that sunlight contains rays of every refrangibility, from the highest to the lowest; and that Newton's sevenfold division of it, though sometimes convenient for popular reference, has no scientific basis. Besides, what we can see is not the whole spectrum but a mere fraction of it; for beyond the red end, there are invisible rays recognized at once by their heating powers; and beyond the violet there are invisible rays more powerful than the visible in producing chemical changes, as on a photographic plate, and which can be changed into visible rays by fluorescent substances: see PHOSPHORESCENCE. The breadth of the visible spectrum evidently depends on the *length* of the slit, and the length of the spectrum on the difference of refrangibility of red and violet.

If the slit in the shutter be very narrow, and the prism be adjusted to the most favorable position (so that the incident and refracted rays make equal angles with the surfaces on which they impinge, and from which they es-

cape, respectively), we see that, after all, the solar S. is *not* continuous. It is found to be crossed at intervals by dark bands (a few of which are sketched below, fig. 5), showing the absence of rays of certain definite refrangibilities. The phenomenon is found to be the same whatever be the substance of the prism: so that these rays are really wanting in sunlight.

This important discovery was made by Wollaston; but the bands were first carefully observed and measured by Fraunhofer, from whom they are commonly called *Fraunhofer's lines.* We owe to him the invaluable suggestion of employing a telescope to examine the S. The refracted rays are received directly on the object-glass of the telescope, which forms an image of the S. to be examined with the aid of the eye-piece, the screen being dispensed with. Wollaston had seen only five lines; Fraunhofer at once discovered 400; Brewster, with more perfect apparatus, counted 2,000; and now, with a train of prisms, and powerful telescopes, their number seems beyond computation. They show every variety of breadth and distinctness, and are grouped in the most irregular manner. For reference, Fraunhofer selected some of the more prominent, to which he attached the earlier letters of the alphabet. By their help he was enabled to measure refractive indices (see REFRACTION) with great precision. The same lines, though far less distinct, are seen in the same relative positions in the spectra of the moon and the planets. Dark lines are discernible in the spectra of the fixed stars also, but their position is different. Sources of light that contain no volatile constituents—e.g., incandescent platinum wire—give continuous spectra, without such lines; but if volatile substances be present, bright lines are seen in the spectrum, characteristic of the volatile substances. If the light of a candle, a bright gas-flame, a white-hot wire, or a lime-ball in the oxyhydrogen flame, be examined in the same way, *no such lines are seen.*

The first to throw any light on this class of facts was Brewster. He showed that when light passed through nitrous acid gas its S. was interrupted by countless lines; and that they increased in number and breadth on application of heat to the gas, so that at a high temperature a thin layer of this gas is *opaque to direct sunlight.* Hence it was natural to conclude that the dark bands in the solar S. are caused by absorption in some medium between us and the sun. It is to be observed, however, that this is on the supposition that light as it comes immediately from the sun would give, like that of the lime-ball or of incandescent platinum, a continuous S. But Brewster went farther. He showed that *some* of Fraunhofer's lines depend on the altitude of the sun, that is on the greater or less space of air, fog, and vapor through which his rays must pass before reaching the earth. *Some of them,* then, *are caused by absorption in the earth's atmosphere.*

But we must now look to another class of phenomena. A spirit-lamp flame gives a very feeble S.; and, if a little common salt be put on the wick, though the flame becomes

instantly very much brighter, no alteration is produced on the S. except the appearance of a *bright* yellow line crossing it at the place where the dark line called by Fraunhofer, D, appears in sunlight. On examining this line carefully, Fraunhofer found that it, like D, is double—and he verified that these two rays were exactly (so far as refractive index goes) two of those wanting in sunlight, and in the light of some of the stars.

About the same time Talbot and Herschel (q.v.) showed that the colors given by Lithia, Strontia, etc., in a spirit-flame were, like that produced by common salt, due to the production of light of several perfectly definite refrangibilities: so that the S. of the lamp-flame was crossed in each case by a series of bright lines, always the same when the same body was placed in the flame; and they suggested (1825) the application of this method to the qualitative analysis of minerals, etc., when the presence of extremely minute quantities of different bodies has to be ascertained. This was, in reality, the foundation of SPECTRUM-ANALYSIS; and the method was, we may say, almost complete so far as practice is concerned. The theory, however, was left incomplete as regards the cause of dark lines in the solar S. Foucault (1849) seems to have been the first to approach the true explanation. An experiment by him, from which, however, he drew no inferences, contains the complete theory. When salt is placed in the voltaic arc (see ELECTRIC LIGHT), the spectrum gives the double bright line (coinciding with the double dark line D) above referred to. When sunlight passes through this arc its dark line D is *strengthened* instead of being filled up, by the yellow light from the arc as we might have expected; and when one of the white-hot carbon-points (which gives a continuous spectrum) is looked at through the yellow arc, the double dark line D appears in its spectrum.

Stokes learning, 1850, that experiments had been made by Prof. Miller of Cambridge Univ. to test with great accuracy Fraunhofer's assertion as to the exact coincidence of the double bright line of a salted flame with the double dark line of the solar spectrum, gave for the first time the physical explanation of the phenomenon. He compared the salt-flame to a space full of tuning-forks or pianoforte wires all tuned to the same note. When they are in vibration they, of course, give out this note—similarly the salt-flame the *bright* lines. When, however, sounds are produced in their neighborhood, as they naturally vibrate to one definite note, they will be set in vibration by it (i.e., will absorb it) if it be part of the sound.—Thus sound which has passed through such a space has had this note eliminated from it—similarly the salt-flame seizes these yellow rays from white light passing through it. This ingenious and satisfactory explanation shows at once that the line D proves the existence of salt (or sodium) in the atmosphere of the sun. Stokes's theory was not published except so far as it was annually given by Sir W. Thomson (q.v.) in his lectures in Glasgow—so that it was independently discovered, or at least its discovery was closely

approximated by other philosophers 8 or 10 years later. The earliest of these was Balfour Stewart, who proved by reasoning and experiment that a body's absorbing power for any ray of light or heat is equal to its radiating power for the same: Ångström all but made the rediscovery: finally, Kirchhoff, by reasoning similar to that of Stewart, and by actually reversing the spectra of certain substances, arrived at the same results; and, in conjunction with Bunsen, applied them to chemical analysis, with the immediate result of discovering two new metals, cæsium and rubidium. Crookes, later, by the same method discovered thallium; and indium, gallium, and sundry earth-metals have been discovered by other chemists. The delicacy of these spectrum reactions is very considerable, but varies with the different metals; it is most striking in the case of sodium; one two-hundreth millionth of a grain of that metal gives in the spectrum the characteristic yellow line.

One of the most valuable parts of Kirchhoff's investigation is his map of the solar S with its dark lines; side by side with which is a S. containing the bright lines given by various metals volatilized in an electric spark. The sunlight is admitted through the upper half of the slit, the light from the burning metal through the lower—thus the two are subject to precisely the same deflections by the train of prisms. The following figure shows a very small portion of Kirchhoff's drawing, and exhibits the exact coincidence of the bright lines produced by highly heated vapors of iron, magnesium, nickel, and calcium, with corresponding dark lines in the solar S. The particular portion exhibited (in the middle of the green). is chosen

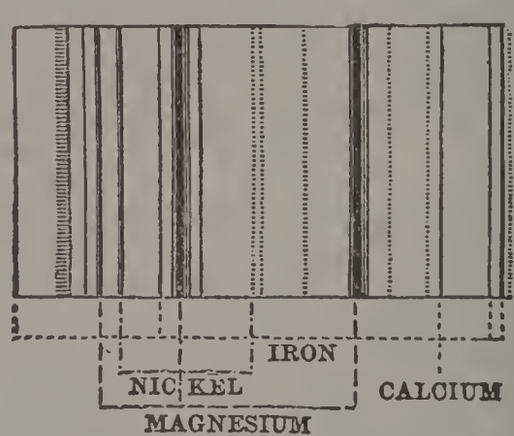


Fig. 5.

because it contains few lines whose origin has not been ascertained. But *every* bright line in the iron S. has a corresponding dark line in the solar S. Kirchhoff and Bunsen, on the basis of these observations, investigated the chemical constitution of the sun's atmosphere, by ascertaining the elements which, when in the state of incandescent vapor, develop bright spectrum lines, coinciding with Fraunhofer's lines in the solar S. The coincidence of Fraunhofer's line D with the bright yellow line of sodium seems evidence of the presence of that metal in the sun's

atmosphere. Kirchhoff moreover proved that 60 bright lines in the spectrum of iron correspond, both as to position and as to distinctness most exactly with 60 dark lines in the solar S.; hence the inference that iron in the state of vapor is present in the solar atmosphere. So with regard to the bright lines of the spectra of other metals and other dark lines of the solar spectrum.

The applications of the S.-analysis are numerous. When there is much moisture in the atmosphere, the solar S. shows what is called the *rain-band*. Huggins showed that the spectra of planetary nebulæ, and of the tails of comets, consist of a few *bright* lines only—indicating that these bodies—or, at all events, those portions of them from which their light proceeds—are masses of incandescent vapors or gases. Stokes has traced, by the alteration of the absorption bands produced by the coloring matter of blood, the oxidation and reduction which constantly take place in this substance, and its connection with the distinction between venous and arterial blood: see SPECTROSCOPE.

SPECULAR: see under SPECULUM.

SPECULATE, v. *spĕk'ū-lāt* [L. *speculātus*, spied out, observed—from *spec'ŭlor*, I behold; *specĭō*, I look at. It. *speculare;* F. *spéculer—lit.*, to spy about]: to study a subject in its various aspects and relations; to meditate; to purchase land, stock, goods, etc., in expectation of realizing large profits by their future sale. SPEC'ULATING, imp. SPEC'ULATED, pp. SPEC'ULATOR, n. *-lā-tĕr*, one who forms theories; one who purchases goods, etc., in expectation of being able to sell them again at a large profit; in *OE*, examiner; spy. SPEC'ULA'TION, n. *-lā'shŭn* [F.—L.]: a train of thoughts arising in the mind from viewing a thing in various aspects and relations; intellectual examination; contemplation; mental scheme not reduced to practice; a theory; the act or practice of purchasing goods, etc., out of the regular order of trade, in expectation of being able to sell them at a large advance in price; in *OE.*, examination by the eye; view; power of sight. SPEC'ULATIVE, a. *-lā-tĭv*, given to speculation; ideal; theoretical; in *OE.*, belonging to view. SPEC'ULATIVELY, ad. *-lĭ*. SPEC'ULA'TORY, a. *-lā'tĕr-ĭ*, exercising speculation.

SPECULUM, n. *spĕk'ū-lŭm* [L. *spec'ŭlum*, a mirror—from *specĭō*, I look at]: metallic reflector; mirror or looking-glass; in *surg.*, instr. for keeping open certain parts of the body that they may be attentively examined. SPEC'ULAR, a. *-lĕr*, resembling a speculum; having a smooth reflecting surface; in *OE.*, affording a view. SPECULUM METAL, alloy of copper and tin with a little arsenic, or of steel and platinum; used in making the specula of reflecting telescopes: the best consists of 10 parts of copper to one of tin, or of equal parts of steel and platinum. To obtain the alloy perfect, and to cast it successfully, are exceedingly difficult, requiring much skill and experience. See TELESCOPE. SPECULAR IRON, an ore of iron, occurring frequently in crystals, of a brilliant metallic lustre.

SPED, *spĕd:* pt. pp. of the v. SPEED, which see.

SPEECH, n. *spēch* [Icel. *spekja,* speech: Ger. *sprechen,* to speak: Bav. *spächten,* to speak; *spacht,* speech (see SPEAK)]: the faculty of speaking; the expression of thoughts by words or articulate sounds; language; anything spoken; harangue; an oration; a formal discourse; talk. SPEECH'LESS, a. *-lĕs,* without power of speech; dumb; silent. SPEECH'LESSNESS, n. *-nĕs,* the state of being speechless. SPEECH-MAKER, one who makes speeches; one accustomed to speak in public. SPEECH'-IFY, v. *spēch'ĭ-fī* [Eng. *speech,* and L. *facĭō,* I make]: to harangue, generally used in contempt. SPEECH'IFYING, imp. SPEECH'IFIED, pp. *-fīd.* SPEECH'IFICA'TION, n. *-fĭ-kā'shŭn,* the act of speechifying.

SPEECH AND ITS DEFECTS: the pre-scientific theory of speech attributes its origin to direct act of God. The two theories generally held at present combine two factors, both of which have undoubtedly been operative in the production of speech as a human device: (1) All mental excitement tends to produce muscular activities. Among these are found movements of the muscles of the throat, lips and tongue. In air breathing animals this sort of muscular activity in connection with the activity of the muscles of the thorax must produce sound. The first linguistic sounds were undoubtedly of this emotionally expressive origin. Such sounds would soon become expressive of certain states of mind to those who heard them. Anger, if expressed by growling noises, would speedily come to have such noises as its indicator. (2) At a later stage, perhaps, there would arise the tendency to *imitate* natural noises as a means of indicating meaning. Thus a bark would mean dog, etc. All gesture must be recognized as a form of language, but the 'gestures' we make with the vocal cords excel all others in the richness of the combinations we can readily produce with them. These gestures are reported to other persons as sounds. By using such sounds we are rendered independent of darkness and intervening obstacles to an extent not equalled by any other mode of available communication.

The process of speech has been analyzed into three factors: (1) Sensory, (2) intellectual or cerebral, and (3) motor. (1) We learn to speak by *hearing* others speak, and the extent to which this factor is involved in accurate speech is displayed by the inability of the deaf to learn speech. Most so-called dumbness is not due to paralysis of the speech muscles, but to inability to control these muscles, because the patient is deaf. Modern methods of instructing the deaf have gone far to remove this difficulty. Nevertheless, it is extremely rare that any congenitally deaf person learns to use speech as well as those who hear. Writing similarly involves for its ready and accurate production the use of the eye.

(2) The intellectual, or the cerebral, factor is funda-

mental, not only in the reception in the form of auditory sensations of the sounds uttered by others, but it is also absolutely indispensable for the correct understanding of the words, for the associating of each sound with its correct meaning. Again the ability to read or to write correctly involves just this same associative mechanism.

(3) This mechanism makes itself effective in the form of motor reactions, which are made either as in spoken language, with the muscles of enunciation, or with the hand as in writing. The coordinations which enter into vocal speech are delicate beyond all belief and complex to a degree which baffles artificial simulation. It is only necessary to attempt the pronunciation of a foreign language to appreciate how intricate these movements are.

Language is not only the great medium of communication, it is also the most important device for the furtherance of individual human thought as such. When one thinks, he must employ language materials to an extent which few appreciate until their attention is explicitly called to the fact.

The diseases which disturb speech may attach to any of the elementary factors mentioned. As was stated above, persons born deaf have the utmost difficulty in learning to speak and many never succeed in really doing so. Even those not born deaf, if they remain deaf for many years, show imperfections in their vocal coordinations, which demonstrate the dependence of correct enunciation upon auditory sensations. Paralyses of either lip, tongue, or throat muscles necessarily obliterate perfect vocal speech and occur not infrequently. The most serious disorders of speech are, however, encountered when the brain is disordered and when the intellectual factor is rendered inoperative. If the cerebral center for the reception of sound is seriously injured (on the left side in right-handed persons) sensory aphasia (q.v.) is likely to result. That is to say, words, though heard as sounds, are not understood. They are like the words of a foreign language. Similarly an injury to the visual centers may produce alexia (q.v.), in which case printed and written words are not understood. If the motor centers for enunciation are injured (with the same qualifications as in sensory aphasia above), words cannot be uttered correctly. The language of such a person is simply a broth of meaningless syllables. When we get tired, all of us are likely to become slightly aphasic and mispronounce our words. This symptom is a common accompaniment of many brain disorders, although not always because of difficulties in the motor centers. Diseases of many of the higher centers of the cerebrum are likely to disturb the speech function whose complexity is suggested by the statements already made. Agraphia (q.v.) is a motor difficulty in which words cannot be correctly written. It is akin to motor aphasia.

SPEECH-SOUNDS. See PHONETIC ALPHABET; also SPELLING REFORM.

SPEED, n. *spēd* [AS. *spédan,* to succeed, to prosper: Low Ger. *spoden,* to haste: Dut. *spoed,* speed: OHG. *spuot,* success]: quickness of motion; haste; rapid action; swiftness; success: V. to hasten; to make haste; to send away quickly; to accelerate; to have success; to assist; to prosper; to fare well or ill; in *OE.,* to have good success; to succeed well or ill; to destroy; to ruin. SPEED'ING, imp. SPED, pt. pp. *spĕd,* did speed. SPEEDY, a. *spēd'ĭ,* quick; prompt; not dilatory or slow. SPEED'ILY, ad. *-ĭ-lĭ,* with haste; quickly. SPEED'INESS, n. *-nĕs,* the quality of being speedy; quickness; haste. GOD SPEED YOU, or GOOD SPEED, may you have good success.—SYN. of 'speed, n.': celerity; quickness; dispatch; expedition; acceleration.

SPEED, JAMES: American politician: b. Jefferson co., Ky., 1812, Mar. 14; d. 1887, June 25. He was graduated from Saint Joseph's College, Bardstown, Ky., in 1828, studied law at Transylvania University, and in 1833 engaged in practice at Louisville, Ky. He was elected to the legislature in 1847 and as state senator in 1861 he took an uncompromising stand against the proposed secession of Kentucky. Later he was in charge of recruiting stations in Kentucky. He was appointed attorney-general by Lincoln in 1864 and continued in office until 1866, when he resigned to resume his law practice and his professorship in Transylvania University. He served as delegate to the Republican national conventions of 1872-6, but otherwise held no further public office.

SPEED, JOHN: English antiquary: b. Farringdon, Cheshire, 1552; d. London, 1629, July 28. He was taught his father's trade of tailoring and in 1580 was admitted to the freedom of the Merchant Taylor's Company. His earlier occupation, aside from the practice of his trade, was the drawing of maps, and in 1608-10 he published a series of 54 *Maps of England and Wales.* These reappeared with descriptive texts as Speed's *Theatre of the Empire of Great Britaine* (1611) and were subsequently issued in several editions. His next work was *The History of Great Britaine Under the Conquests of Ye Romans, Saxons, Danes and Normans, . . . with the Successions, Lives, Acts and Issues of the English Monarchs from Julius Cæsar to . . . King James.* This work places Speed as the first English historian in distinction from the annalists and chroniclers of preceding times, but in accuracy the work left much to be desired. He published also *Genealogies Recorded in Sacred Scripture, A Cloud of Witnesses . . . confirming unto us the Truth of the Histories in God's most Holie Word* (1616).

SPEED'WELL (*Veronica*): genus of plants of nat. order *Scrophulariaceæ,* distinguished by a 4-cleft wheel-

shaped corolla, with the lower segment narrower, two stamens, and a two-celled capsule. The species are very numerous, annual and perennial herbaceous plants and small shrubs, natives of temperate and cold climates in all parts of the globe. Some grow in wet ditches and in marshes, some only on driest soils. They have generally very beautiful blue, white, or pink flowers. Few wild-flowers are more beautiful than the Germander Speedwell (*V. Chamædrys*), or the alpine species, *V. alpina* and *V. saxatilis*. A number of species are cultivated in flower-gardens.—The bitter and astringent leaves of the COMMON SPEEDWELL (*V. officinalis*), found in almost all n. parts of the world, are in some countries used as tonic, sudorific, diuretic, and expectorant medicine. They are used also, particularly in Sweden, as substitute for tea; as are leaves of the Germander Speedwell.—*V. Virginica* is called *Calver's Physic* in this country; it is said to be actively diuretic, and a decoction of the fresh root is violently cathartic and emetic.—Book-lime belongs to this genus.

SPEIER, or SPEYER, *spī'ér* or *spīr* (F. *Spires*): capital of Rhenish Bavaria (the former Palatinate), and one of the oldest towns in Germany; at the influx of the Speyerbach into the Rhine, 14 m. s.w. of Heidelberg, 23 n. of Carlsruhe. It is a station on two railways—Schifferstadt and Germersheim, and Heidelberg and Speier. The principal building is the cathedral (founded 1030), which contains the tombs of numerous emperors of Germany: since 1856 it has been wholly renewed, and is the grandest specimen of Romanesque architecture in Europe; it has a hall of Roman antiquities discovered in the Palatinate, and is adorned with 30 magnificent frescoes by Schraudolph.

Except the cathedral and a ruined wall, the sole relic of the imperial palace in which 29 diets were held—at one of which (1529) the Reformers made their famous 'protest,' and got for themselves the name Protestants (see PROTESTANT)—Speier contains no ancient buildings: the cause is, that in the Orleans Succession War—well called by the Germans the *Mordbrenner Krieg*—during which the whole Palatinate was savagely wasted, Speier was taken by the French, its inhabitants driven out, and the city blown up with gunpowder and burned to the ground. Only the cathedral resisted the barbarous efforts to mine it. Everything else was reduced to rubbish, and for long years the noble old pile overlooked nothing but a melancholy waste of ruins. In 1794 it was again wasted by the French under Custine; and has never recovered from these calamities. Speier manufactures tobacco and cigars, shoes, machinery, paper, cutlery; and has some transit-trade on the Rhine. Pop. (1901) 20,911, of whom about half are Roman Catholics.

Speier, the *Noviomagus* of the Romans, was the capital

of the Nemetes, a German people. Speier was probably the native name from the first, for in some later Roman notices (7th c.) it is called *Civitas Nemetum, id est Spira.* A Christian community appears to have been established here as early as 150-200, and it was certainly the seat of a bishop about 300. The German emperors had here a *pfalz* (palace, Lat. *palatium,* whence the former name of the region of which it was the capital, the Pfalz or Palatinate), in which they often resided. By them the town was made a Free City of the Empire; and having obtained the monopoly of the carrying-trade up and down the Rhine, it rapidly rose in wealth and importance. The *Reichskammergericht,* or imperial chamber of justice, the highest court of the German empire, was held here for 200 years, until removed to Wetzlar 1689.

SPEIR, v. *spēr* [AS. *spyrian;* Icel. *spyrja,* to search out by the track or trace, to inquire—from *spor;* D. *spoer;* Ger. *spur,* a track]: to make diligent inquiry; to ask; to inquire: N. an inquiry; an object sought.

SPEIRANTHY, n. *spīr'ăn-thĭ* [Gr. *speira,* a twist or curl; *anthos,* a flower]: in *bot.,* the twisted growth of the parts of a flower.

SPEISS, n. *spīs* [Ger. *speise,* mixed metal]: compound obtained in smelting the lead ores of certain localities, especially those from Freiberg in Saxony: it consists mainly of arsenic and iron, but often contains cobalt and nickel.

SPEKE, *spēk,* JOHN HANNING: African traveler: 1827, May 4—1864, Sept. 15; b. at Jordans, near Ilchester, Somersetshire, England. He was educated at the Barnstaple grammar school, and at the age of 17 went to India. He entered the native Bengal infantry as a cadet, and saw much service during the war in the Punjab. A keen sportsman, with a taste for natural history, he employed his rifle in collecting for the museums specimens of the rarer mammals and birds of India, and with this view he undertook several exploratory trips into the Himalaya. While so employed, he conceived his purpose of African travel. The English government had resolved, 1854, to dispatch an expedition from Aden into the neighboring region of Africa, under command of Capt. Burton (q.v.). Speke, then a lieutenant in the Indian army, reached Aden at this time on leave of absence, and resolved to join Burton and his companions, Lieuts. Herne and Stroyan. Burton went to Harar; and Speke was detached to visit the Dalbahantas, the most warlike of the Somauli tribes. On the return of the travelers to their starting-point on the coast, they were attacked by 150 men. Stroyan was killed, and Speke made a narrow escape with 11 wounds. The attention of the Geographical Society of London had now been called to the great lakes of tropical Africa; and 1857, June, they dispatched Burton and Speke, who entered the country from Zangue-

bar, as the German missionaries Krapf and Rebmann had done 1847; and discovered the great lake Tanganyika. In returning to the coast, Speke marched alone to the northward, and discovered the Victoria Nyanza. In 1860 he returned to Africa, accompanied by Capt. Grant, to confirm his former discovery, when he explored the w. and n. shores of Nyanza, and discovered an outlet northward (see NILE). On their return to England 1863, they met an enthusiastic reception. The substantial correctness of the geographical discoveries of Speke has been established by Henry M. Stanley, who sailed round the Victoria Nyanza 1876. Speke was killed by a gun-accident while out shooting in the neighborhood of Bath, to which he had come to be present at a meeting of the British Association.—Speke is author of a *Journal of the Discovery of the Source of the Nile;* and *What Led to the Discovery of the Source of the Nile.*

SPELDINGS, n. *spĕl'dĭngz,* or SPEL'DRONS, n. *-drŏnz* [from root of SPELL 2]: in *Scot.,* haddocks or whitings cured and dried in a particular way.

SPELICANS, n. plu. *spĕl'ĭ-kănz* [O.Dut. *spelleken,* a small pin (see SPELL 2)]: a game played with thin slips of wood or ivory.

SPELL, n. *spĕl* [Icel. *spilda,* a piece of anything: Low Ger. *spall,* a portion of land; *spiel,* a game]: continuance; duration; space; a bout or pull; a turn of work; a job: V. to take another's place, as in labor.

SPELL, v. *spĕl* [Dut. *spell,* a splinter of wood; *spellen,* to spell, pointing out the letters with a *spill,* or splinter of wood]: to tell the letters of a word one by one; to write or print words with their proper letters; in *OE.,* to relate; to teach; to read. SPELL'ING, imp.: N. the act of naming the letters of a word; orthography. SPELLED, pp. *spĕld,* or SPELT, pp. *spĕlt.* SPELLING-BOOK, a book for teaching children to read and spell.

SPELL, n. *spĕl* [AS. *spellian,* to recite]: any form of words which, when recited, were supposed to possess magical power; a charm: V. to charm by reciting a form of words. SPELL'ING, imp.: ADJ. acting as a spell or charm. SPELLED, pp. *spĕld.* SPELLBOUND, a. arrested or locked up by a spell or charm.

SPELLING REFORM: a systematic attempt to represent in writing and print the accepted pronunciation of words. Such changes as have been made in any of the languages where the attempt has been made are of a purely tentative order. As was to be expected in view of the power of the French Academy, the greatest advance towards a satisfactory and consistent spelling has been made in the French language, but there remains still much to be done before the written word is as indicative of the correct pronunciation as is the case of Italian, for instance. In Germany the first moves toward improvement were made in 1880, the chief features

of which were the omission of superfluous signs, the substitution of *f.* for *ph.*, the determination of the distinction between the hard and soft sounds of *s*, and changes of such nature. In English, Dr. Johnson's Dictionary, published in 1755, marked the beginning of the era of uniformity. Previous to this, people spelled as they pleased or as they could, sometimes using two or even more forms of the same word in the same paragraph. Shakespeare is known to have spelt his own name in 30 different ways, and other writers of the times previous and after 1755 were hampered by none, or very slight conventional rules, and were free to spell 'like gentlemen,' not like pedants. The attempt to reform English spelling did not begin with Johnson; his work simply marked the place this reform had reached, and set up a common standard. The reform began very early, and it is really no argument against the most advanced propositions to say we are getting away from the language of Shakespeare and the Bible, for if we take the trouble to compare the orthography of the Bible of 1611 with the Bible of today, with whose spellings there is no complaint, as many as 116 changes may be found in one chapter, the CVI. Psalm for instance. The greatest step forward toward a common-sense system was made by Webster in his *American Dictionary* (1828), but much as his changes were decried, they were mostly those which had been recommended by others; as for instance, dropping the Norman French *u* (to which our English cousins still cling) from *favour, honour,* etc.; changing the French *metre,* etc., to *meter;* omitting certain double consonants, and instead bring the spelling of certain classes of words into a uniformity of style—thus making *mould* into *mold,* to agree with *gold,* which had been similarly treated. The 'Spelling Reform Association' was formed at an international convention held in Philadelphia in 1876; the English association was established in 1879, and in 1884 certain changes were recommended for adoption by both associations as follows:

1. e.—Drop silent *e* when fonetically useless, as in *live, vineyard, believe, bronze, single, engine, granite, eaten, rained,* etc.
2. ea.—Drop *a* from *ea* having the sound of *e,* as in *feather, leather, jealous,* etc.
   Drop *e* from *ea* having the sound of *a,* as in *heart, hearken,* etc.
3. eau.—For *beauty* use the old *beuty.*
4. eo.—Drop *o* from *eo* having the sound of *e,* as in *jeopardy, leopard.*
   For *yeoman* write *yoman.*
5. i.—Drop *i* from *parliament.*
6. o.—For *o* having the sound of *u* in *but,* write *u,* in *above* (abuv), *dozen, some* (sum), *tongue* (tung), etc.
   For *women* restore *wimen.*
7. ou.—Drop *o* from *ou* having the sound of *u,* as in *journal, nourish, trouble, rough* (ruf), *tough* (tuf), and the like.
8. u.—Drop silent *u* after *g* before *a,* and in native English words, as *guarantee, guard, guess, guest, guild, guilt,* etc.

9. ue.—Drop final *ue* in *apologue, catalogue,* etc., *demagogue, pedagogue,* etc., *league, colleague, harangue, tongue* (tung), etc.
10. y.—Spell *rhyme* rime.
11. Dubl consonants may be simplified.
Final *b, d, g, n, r, t, f, l, z,* as in *ebb, add, egg, inn, purr, butt, bailiff, dull, buzz,* etc. (not *all, hall*).
Medial before another consonant, as *battle, ripple, written* (writn), etc.
Initial unaccented prefixes, and other unaccented syllables, as in *abbreviate, accuse, affair,* etc., *curvetting, traveller,* etc.
12. b.—Drop silent *b* in *bomb, crumb, debt, doubt, dumb, lamb, limb, numb, plumb, subtle, succumb, thumb.*
13. c.—Change *c* back to *s* in *cinder, expense, fierce, hence, once, peace, scarce, since, source, thence, tierce, whence.*
14. ch.—Drop the *h* of *ch* in *chamomile, choler, cholera, melancholy, school, stomach.*
Change *ch* to *k* in *ache* (ake), *anchor* (anker).
15. d.—Change *d* and *ed* final to *t* when so pronounced, as in *crossed* (crost), *looked* (lookt), etc., unless the *e* affects the preceding sound, as in *chafed, chanced.*
16. g.—Drop *g* in *feign, foreign, sovereign.*
17. gh.—Drop *h* in *aghast, burgh, ghost.*
Drop *gh* in *haughty, though* (tho), *through* (thru).
Change *gh* to *f* where it has that sound, as in *cough, enough, laughter, tough,* etc.
18. l.—Drop *l* in *could.*
19. p.—Drop *p* in *receipt.*
20. s.—Drop *s* in *aisle, demesne, island.*
Change *s* to *z* in distinctive words, as in *abuse* (verb), *house* (verb), *rise* (verb), etc.
21. sc.—Drop *c* in *scent, scythe* (sithe).
22. tch.—Drop *t* in *catch, pitch, witch,* etc.
23. w.—Drop *w* in *whole.*
24. ph.—Write *f* for *ph,* as in *philosophy, sphere,* etc.

The subject of spelling reform did not attract any general attention for more than 20 years in spite of the publication of periodicals devoted to the propaganda, and the occasional outbreak of some enthusiastic votary, but in 1906 the establishment of the 'Simplified Spelling Board' gave the reform a vigorous thrust forward. The board recommended for adoption a list of 300 'simplified spellings' with which to begin the change toward a more scientific literation of the language. This move would probably have attracted no more notice than many of its predecessors, had not President Roosevelt issued an executive order (1906, Aug.) directing the public printer to use all these spellings in the papers sent out by his office. Congress, however, would not allow these changes to be made in the papers that came to the members from the printer, and in 1906, Dec., the order was rescinded. The rather ill-advised exuberance of some of the advocates of the reform has made it an object of temporary ridicule, but the probabilities are that the really great advantages to be gained will be more and more appreciated, until the work of the reformers produces tangible and enduring results. The practice of isolated individuals may help, but real reform will not come until

some large and important body, such as congress, takes official action.

SPELT, v. See under SPELL 2.

SPELT, n. *spĕlt* [AS. *spelt,* grain, corn]: an inferior kind of wheat of France and Flanders; the rye and fitches of the Bible; the *Tritĭcum spelta,* ord. *Gramin'ĕæ; T. monococ'cum* is a variety of spelt called St. Peter's corn. See WHEAT.

SPELTER, n. *spĕl'tėr* [Low Ger. *spialter;* Dut. *spiauter,* spelter]: zinc in thick plates or masses, usually unrefined. See ZINC.

SPENCE, n. *spĕns* [OF. *despenser,* to spend—from L. *dispensus,* weighed out; *dispendĕrĕ,* to weigh out—from *dis,* apart; *pendĕrĕ,* to weigh]: in *OE.* and *prov. Eng.,* a cupboard; a safe; a convenient place in which to keep the provisions of a house; a pantry; in *Scot.,* a sitting and eating room.

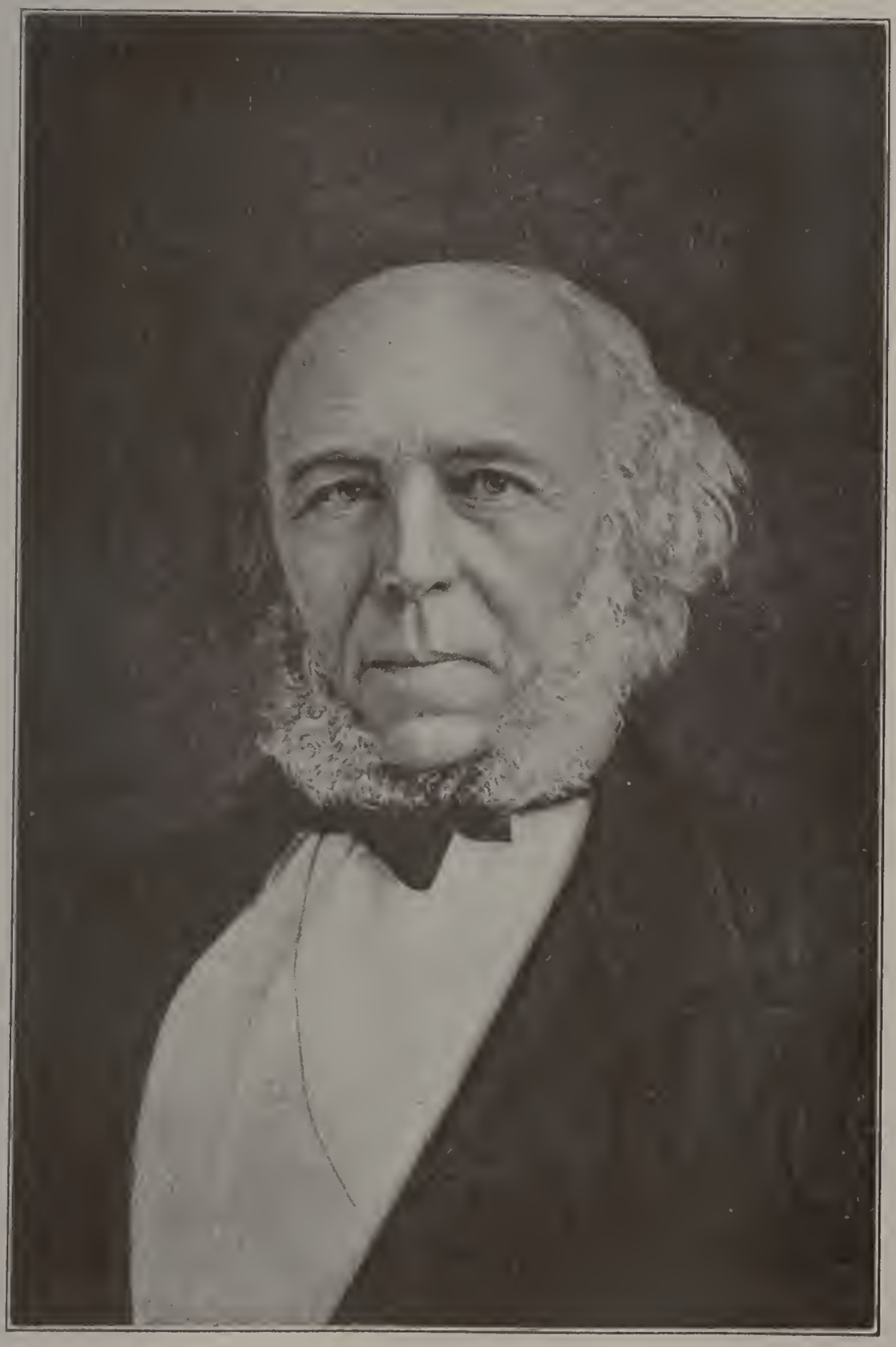
SPENCER, n. *spĕn'sėr* [named after the third Lord *Spencer,* who first wore it]: a short over-jacket, worn either by men or women.

SPENCER, n. *spĕn'sėr* [etym. doubt.]: in *naut.,* a four-cornered fore-and-aft sail, whose head is extended by a gaff and its foot usually by a sheet. Its position is abaft the fore or the main mast, and it is frequently bent to a spencer-mast. It is a trysail to the fore or main mast, and differs from a spanker or driver in position. The latter belong to the mizzen. SPENCER-MAST, n. small mast abaft a lower mast for hoisting a trysail.

SPENCER, *spĕn'sėr:* town, one of the capitals of Worcester co., Mass.; on the Boston & Albany railroad; 11 m. s.w. of Worcester. It has several churches, large hotel, high and graded public schools, public library, lyceum, banks, and weekly newspapers. The town is noted for its manufactures, chiefly boots and shoes, woolen goods, and wire. Pop. (1910) 6,740.

SPENCER, GEORGE ELIPHAZ: 1836, Nov. 1—1893, Feb. 19; b. Jefferson co., N. Y. He was educated in Canada; admitted to the bar in Iowa 1856; elected secretary of the state senate 1858; entered the Union army as assistant adjutant-general 1862; recruited the 1st Alabama cavalry, of which he became colonel 1863; was brevetted brigadier-general and resigned 1865. In 1867 he was elected U. S. senator from Alabama as a republican, served till 1879, and was active in exposing the star-route frauds and in promoting legislation for the reduction of letter postage to two cents. He was appointed commissioner of the Union Pacific railroad 1881, and afterward engaged in mining and cattle-raising in Nevada.

SPEN'CER, HERBERT: English philosopher, who attempted to work out a system of philosophy in harmony with the principles of modern science: b. Derby, 1820;



HERBERT SPENCER.

d. 1903, Dec. 8. His father, schoolmaster in that town, about 1814 became hon. secretary of the Derby Philosophical Association, which had been founded by Dr. Erasmus Darwin. From his father Spencer imbibed that love of natural science and wonderful faculty of observation so conspicuous in his works. The father seems to have been interested chiefly in entomology; and Spencer used to collect, describe, and draw insects when a boy. Rejecting the Cambridge career recommended by his uncle, the Rev. Thomas Spencer—a clergyman well known for liberal opinions on social and political questions—he became a civil engineer at Derby at the age of 17; but about eight years afterward gave up this profession, having gradually entered on journalistic and literary work. He had already contributed various papers to the *Civil Engineers' and Architects' Journal;* and in the latter half of 1842 he wrote a series of letters to the *Nonconformist* newspaper on 'The Proper Sphere of Government,' republished in pamphlet 1843. These letters imply a belief in human progress based on the modifiability of human nature through adaptation to its social surroundings, and maintain the tendency of these social arrangements 'of themselves to assume a condition of *stable* equilibrium.' He was engaged on the *Economist* newspaper 1848-53, and at this time he developed the ethical and political consequences of the ideas that he had enunciated; and sought an independent basis for them in his first important work, *Social Statics* (1850). It is thus noticeable that Spencer's philosophical activity began with ethical and social questions. The evolution of man and society as determined by circumstances, and the idea that organic and social evolutions are under the same law, *preceded* the elaboration of those scientific ideas which, in the complete *System of Philosophy,* are made to serve as their basis. The truth anticipated by Harvey and Wolff, but first put into definite shape by Von Baer—'the truth that all organic development is a change from a state of homogeneity to a state of heterogeneity'—is regarded by Spencer as the organizing principle of his subsequent beliefs. It was gradually developed and applied by him in a series of articles contributed in the following years to the *Leader,* the *North British, Medico-Chirurgical, Westminster,* and other reviews.

In these essays, especially those on *Manners and Fashion* (1854), and *Progress: its Law and Cause* (1857); and in the volume *Principles of Psychology* (1855), the doctrine of evolution began to take definite form, and to be applied to various departments of inquiry. The publication of Darwin's *Origin of Species,* 1859, gave a wide basis of scientific evidence for what had been mere speculation, and first showed the important part played by natural selection in development.

In 1864 Spencer published an essay on the *Classifica-*

tion of the Sciences [new ed. 1864 entitled *Reasons for Dissenting from Philosophy of Comte*], in which he criticized Comte's serial arrangement of the sciences according to generality, and substituted for it a classification according to abstractness: (1) *Abstract Science,* treating of the forms (space and time) in which phenomena are known to us—logic and mathematics; (2) *Abstract-Concrete Science,* treating of the laws of the factors of the phenomena themselves—mechanics, physics, chemistry, etc.; (3) *Concrete Science,* treating of the phenomena in their totalities (the laws of the products)—astronomy, geology, biology, psychology, sociology, etc.

On this scheme of the sciences, Spencer had now been working for several years. As early as 1860 he had announced the issue of a *System of Synthetic Philosophy,* already in preparation; which, beginning with the first principles of all knowledge, proposed to trace how the law of evolution was gradually realized in life, mind, society, and morality. In pursuance of this comprehensive design, Spencer has published: *First Principles* (1860-62, in parts); *Principles of Biology,* 2 vols. (1866-67); *Principles of Psychology,* 2d ed., 2 vols. (1870-72); *Principles of Sociology,* vol. I. (1876); '*Ceremonial Institutions*' (1879), and '*Political Institutions*' 1882), composing vol. II.; '*Data of Ethics,*' being Part I. of *Principles of Ethics* (1879); *Justice,* Part IV. of *Prin. Eth.,* 1891; *Negative and Positive Beneficence,* Parts V., VI., *Prin. Eth.*

In method, Spencer's philosophy is essentially speculative or deductive. It does not begin with observation and experiment, and rise through them to scientific generalizations. Its starting-point is certain truths supposed to be ultimate, and the source from which all others are to be deduced; and its justification is sought in its ability to explain phenomena from its assumed standpoint. This is due not merely to the adoption of the synthetic form of exposition. The ultimate test is in all cases the mental inconceivability of the opposite of the proposition by the individual thinker.

Metaphysically, Spencer's system is founded on the doctrine of relativity which Hamilton and Mansel deduced from Kant, but carried, as he says, a step further. With the definite consciousness of things known in relation to one another, there is implied an indefinite consciousness of an absolute existence, in the recognition of which as inscrutable, science and religion find their reconciliation. All definite consciousness or knowledge is of the manifestations of this unknowable power; and knowledge, completely unified, is philosophy. The data of philosophy are necessarily those organized components of our intelligence without which philosophizing could not go on. 'Our postulates are: an unknowable power; the existence of knowable likenesses and differences among the manifestations of that power; and a resulting segregation of the manifestations into those of subject

and object.' Within each segregated mass there are likenesses and differences involving secondary segregations. The modes of cohesion under which manifestations are invariably presented are called, when contemplated apart, space and time; when contemplated with their manifestations, matter and motion. All these are traceable to experiences of that mode of consciousness whose reality is shown by its persistence—to force. By the 'persistence of force' is meant, the unchanging quality both of that mode of force which is revealed to us only by opposition to our own powers, and is not a worker of change; and of that mode which is a worker of change actual or potential, and is specifically termed energy. The persistence of force—that is, the persistence of some cause which transcends our knowledge and conception—is the truth which all other truths imply, and from which they all (including the law of evolution) are derived. From the fact that force can neither arise out of nor lapse into nothing, follows the uniformity of law. Force never disappears; it is only transformed. Motion follows the line of least resistance, and is perpetually reversed within limits—is rhythmical. So far of the factors of phenomena. The phenomena themselves must be under a law of the concomitant redistribution of matter and motion, which holds of every change. The law of the entire cycle of changes passed through by every existence is loss of motion and consequent integration, i.e., evolution, eventually followed by gain of motion and consequent disintegration, i.e., dissolution. In its complete shape, the 'formula of evolution' is thus stated: 'Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from an indefinite incoherent homogeneity to a definite coherent heterogeneity; and during which the retained motion undergoes a parallel transformation.' This law of evolution applies equally to all orders of phenomena—whether 'astronomic, geologic, biologic, psychologic, sociologic, etc.'—since these all are component parts of one cosmos, though distinguished from one another by conventional groupings. So long as evolution is merely established by induction, it does not belong to philosophy. It must be deduced from the persistence of force. And this can be done. For any finite aggregate being unequally exposed to surrounding forces will become more diverse in structure; every differentiated part will become the parent of further differences; at the same time, dissimilar units in the aggregate tend to separate, and those which are similar to cluster together ('segregation'); and this subdivision and dissipation of forces, so long as there are any forces unbalanced by opposite forces, must end at last in rest; the penultimate stage of this process, 'in which the extremest multiformity and most complex moving equilibrium are established,' being the highest conceivable state.

The various derivative laws of phenomenal changes being thus deducible from the persistence of force, it remains to apply them to inorganic, organic, and superorganic existences. The detailed treatment of inorganic evolution being omitted from Spencer's plan, he proceeds 'to interpret the phenomena of life, mind, and society, in terms of matter, motion, and force.'

It is impossible to give here any but the most general idea of the contents of the volumes in which the law of evolution is applied to these different departments. It is made not only to account for the phenomena within each group, but also for the connection between one science and another. The researches of Darwin had accumulated ample material for showing the continuity of development, structural and functional, in plants and animals; and Spencer's view of biology, and the definition of life that he proposes ('the definite combination of heterogeneous changes both simultaneous and successive in correspondence with external co-existences and sequences'), are meant to show its connection both with inorganic changes on the one hand, and with mind on the other. Now, just as biology has to deal with the connection between phenomena in the organism, and as physical science treats of the connection between phenomena in the environment, so psychology has to do with the connection between these two connections. For this is said to be the objective aspect of what states of consciousness are subjectively.

Objectively, an attempt is made to trace the evolution of mind from reflex action through instinct to reason, memory, feeling, and will, by the interaction of the nervous system with its environment. Subjectively, mental states are analyzed, and it is contended that all of them —including those primary scientific ideas, the perceptions of matter, motion, space, and time, assumed in the *First Principles*—can be analyzed into a primitive element of consciousness, something which can be defined only as analogous to a nervous shock. These perceptions have now become innate in the individual. They may be called—as Kant called space and time—forms of intuition; but they have been acquired empirically by the race through the persistence of the corresponding phenomena in the environment, and from the accumulated experiences of each individual being transmitted in the form of modified structure to his descendants.

This principle of heredity is one of the laws by which individuals are connected with one another into an organic whole; and we thus pass quite naturally to what Spencer calls superorganic evolution, implying the co-ordinated actions of many individuals, and giving rise to the science of sociology. Society, like an individual man, is shown to be an organism from the fact and laws of its growth, the nature of its activities, and the interdependence of its parts; though it is distinguished from

the individual organism in this, that it is discrete, while the latter is concrete: 'there is no social sensorium.' As societies advance in size and structure, they work on one another profound metamorphoses, now by war-struggles and now by industrial intercourse.

Assisted by a series of elaborate ethnographical charts (*Descriptive Sociology*) prepared under his direction, Spencer has attempted to trace the development of human ideas, customs, ceremonial usages, and political institutions. The genesis of religion is traced to ancestor-worship, or generally to worship of the dead. The notion of another life—from which those of gods and God are gradually evolved—is originated mainly by 'such phenomena as shadows, reflections, and echoes'—these being regarded as indications of a 'double' or other self, which is not extinguished with the death of the first self. It is this fear of the dead which is the root of the religious control, just as it is the fear of the living which is the root of the political control. Ceremonies and institutions alike have their root in this fear of the stronger and submission to the conqueror. Thus, early communities being of the predatory or militant type, tended to centralized control; while industrial communities, which are now gaining ground, tend to free institutions and to the restriction of the sphere of government to the negative duty of preventing interference (*laissez faire*). A still higher type than the industrial is possible in the future, by inverting the belief that life is for work into the belief that work is for life; just as the industrial inverts the belief that individuals exist for the state into the belief that the state exists for individuals.

The principles of morality are regarded by Spencer as the copestone of his system, all his other investigations being only preliminary to them. Ethics he considers as rooted in physical, biological, psychological, and social phenomena; for by them the conditions of human activity are prescribed and supplied. The best conduct is that which most fully realizes evolution—which promotes the greatest totality of life in self, offspring, and fellow-men—the balance of egoism and altruism being attained by a compromise between these contending principles. The measure of life is said to be pleasure, but the Utilitarian school are at fault in assuming that the end (greatest happiness) is better known than the means to it (morality), and for ignoring the fact that accumulated experiences of utility have become consolidated in the race into a moral sense.

In the above summary, it has been impossible to give any idea of either the strength or weakness of the proof by which this elaborate system is supported. In general, it may be said that its strength lies in the author's brilliant power of generalization, his acquaintance with various departments of science, and his unsurpassed wealth of illustration. But a clear analysis of the notions that he employs is often lacking. Hence the

unsatisfactoriness of the distinction between definite consciousness, or knowledge, and the indefinite consciousness implied by it, which is not knowledge; the want of any proved relation between his objective and subjective aspects of psychology; the implicit assumption at the outset of the perceptions of space, etc., when the attempt is being made to show how they have been gradually produced in the mind, by the action of the environment. Thus, too, in the *Sociology,* the ethnographical method is followed to the exclusion of the more scientific historical method; and in the *Data of Ethics,* the compromise between egoism and altruism is left somewhat indeterminat Besides the works already mentioned, Spencer is author of a volume on *The Study of Sociology* (1872), and of a book on *Education* (1861). His occasional papers have been collected and published in four volumes of *Essays: Scientific, Political, and Speculative.* Enlarged ed., 1891.

The wide knowledge which all his writings display of physical science, and his constant endeavor to illustrate and support his system by connecting its positions with scientific facts and laws, have given his philosophy great currency among men of science—more so, indeed, than among philosophical experts. At the same time, not only have the development and application that he has given to the theory of evolution, profoundly influenced contemporary speculation, but he must also be regarded as one of the few in history who have carried out the attempt to give a systematic account of the universe in its totality. Spencer has founded a school of thought in America; and to it is due one of the best philosophical treatises adopting his principles—the *Outlines of Cosmic Philosophy,* by John Fiske. In 1896, Nov. 14, Spencer published vol. III of his *Principles of Sociology,* completing the series of philosophical works begun 36 years before, and aiming to show in detail the unity of all knowledge.—See DARWINIAN THEORY; DESCENT OF MAN; SPECIES; ANTHROPOLOGY; etc. Consult F. Howard Collins, *Epitome of the Synthetic Philosophy,* authorized by Spencer himself; Josiah Royce, *Herbert Spencer* (1904); and Spencer's *Autobiography.*

SPENCER, ICHABOD SMITH, D.D.: 1798, Feb. 23—1854, Nov. 23; b. Rupert, Vt.: Presb. minister. Graduated at Union Coll., he was master of a grammar school in Schenectady, N. Y., and of Canandaigua Acad. 1825; colleague of the Rev. Solomon Williams, First Church, (Congl.) Northampton, Mass., 1826-32: pastor of the Second Presb. Church, Brooklyn, N. Y., 1832-54. His preaching had great pungency and directness. He was one of the projectors of Union Theol. Seminary, and lectured on sacred hist. He declined the presidencies of Hamilton Coll. and Alabama Univ. His most noted publication was a volume of *Pastor's Sketches,* which had extensive circulation.

SPEN'CER, JOHN CANFIELD, LL.D.: 1788, Jan. 8—1855, May 18; b. Hudson, N. Y.; son of Judge Ambrose S. Graduated at Union Coll. 1806, he was private sec. of Gov. Tompkins 1807; admitted to law practice at Canandaigua 1809; judge-advocate in the army 1813; district atty. of w. N. Y. 1815; dem. mem. of congress 1817–19, and author of the committee report on the U. S. Bank; mem. of the N. Y. assembly, and one year speaker of the same 1820–1; state senator 1824–28, and leader of 'the Clinton faction;' anti-Mason, and special atty. on the Morgan case, resigning from it 1830; sec. of state and state supt. of schools 1839–40; regent of Union Coll. 1840; U. S. sec. of war 1841–43, becoming sec. of the treasury, but resigning on account of the annexation of Texas 1844. He was a mem. of various state commissions, among others on the revision of the statutes. He was author of preface and notes for De Tocqueville's *Democracy in America*, and, with colleagues, of the Revised Statutes of the State of New York.

SPEN'CER (JOHN CHARLES SPENCER), third Earl; better known by his courtesy-title, LORD ALTHORP: English statesman: 1782, May 30—1845, Oct. 1; b. Spencer House, London; son of the second earl.—The founder of the family of Spencer was the Hon. John S., youngest son of the third Earl of Sunderland, by Anne, daughter and coheiress of the great Duke of Marlborough; he inherited much property from his grandmother, Sarah, Duchess of Marlborough. His only son was made Earl S. 1765.—The second earl, GEORGE JOHN S., D.C.L. (1758–1834), was first lord of the admiralty in Pitt's administration—1794–1801—the period of the great naval victories of Camperdown, Cape St. Vincent, and the Nile: he retired when Addington became premier, and became distinguished as a munificent collector of rare books.

The third Earl S.—subject of this notice—was educated at Harrow School, and afterward at Trinity College, Cambridge. He entered parliament 1804 as member for Oakhampton. In 1806 his father took office as sec. of state for the home dept. in the Grenville-Fox ministry, and S. became a junior lord of the treasury. He sat in parliament for Northamptonshire from 1806 until the period of the Reform Bill. He went out with the whigs 1807, and during their long exclusion from office, steadily opposed the tory govt. On the dissolution of the Wellington cabinet 1830, Nov., S. was appointed chancellor of the exchequer and leader of the house of commons in the celebrated Reform ministry of Earl Grey. The Reform Bill was introduced by Lord J. Russell (q.v.), but the task of carrying the bill devolved mainly on S. In 1833 he brought in and carried the ministerial bill for reforming the Irish Church. In this memorable working session, the curious statistician discovered that S., who had, from his post of ministerial leader, naturally been the most frequent speaker, had addressed the house 1,026 times, his speeches occupying 387 columns in the then *Mirror of Parliament*. In 1834 he introduced and carried

the Poor-law Amendment Act. When the Irish Coercion Bill was under consideration in the cabinet, S. had opposed the clauses prohibiting public meetings, yet had given way rather than break up the ministry; but when the truth was elicited in debate by O'Connell, S. resigned. He was Earl Grey's 'right-hand man,' without whose aid the earl felt himself unable to carry on the govt. Under Viscount Melbourne, S. consented to resume his office. 1834, Nov., he was called by the death of his father to the house of peers, which had the effect of bringing the Melbourne (q.v.) administration to an end. When the attempt of Sir R. Peel to carry on the govt. failed, S. declined to take office again. He gave his time to agricultural pursuits, and suggested the formation of the Royal Agri. Soc., of which he was elected pres. 1838. He died at his seat, Wiseton Hall, Notts, without issue; and was succeeded by his brother. During his political career, his absolute simplicity of character and integrity of purpose obtained for him the appellation 'Honest Lord Althorp.' He was not an orator; but his integrity and his clear and practical intellect gave him supreme influence over the reformed house of commons. It was said by Lord Hardinge that Lord Althorp nullified the effect of a strong speech by Croker by his mere statement that some statistics which he had collected refuted Croker's views, but that he had lost them; the house accepted his statement as a substitute for the statistics. Lord Brougham dedicated to him his work on *Natural Theology*, and his *Dialogues on Instinct* are supposed to be carried on with S.—See *Memoir* by Sir Denis Le Marchant, Bart. (London 1876).

SPEN'CER (JOHN POYNTZ SPENCER), Earl, K.G., LL.D.: statesman: b Spencer House, London, 1835, Oct. 27; son of the 4th Earl S.; grandson of the 3d earl, John Charles S. (q.v.). He was educated at Harrow School and Cambridge; in 1857 was M.P. for a few months, but in Dec. succeeded to the earldom. He was lord-lieut. of Ireland 1869–74, Feb., under Gladstone's administration; and again 1882, May 4—1885, June. On the evening of his arrival in Dublin 1882, May 6, Cavendish and Burke, chief sec. and under-sec., were assassinated, and it fell to S.'s lot to administer the provisions of the stringent Crimes Act then in force: in these difficult circumstances S. acted with equal firmness and moderation. When Gladstone was restored to power 1886, S. became lord pres. of the council in the liberal cabinet. In the split in the liberal party, S. stood with Gladstone for Irish home-rule.

SPEN'CER, JOSEPH: 1714–1789, Jan. 13; b. E. Haddam, Conn.: revolutionary soldier. He was educated for the law; became judge of probate 1753; maj. in the army 1758; brig.gen. in the continental army, 1775; and maj.gen. 1776; commanded the expedition against the British in R. I 1777; and, because of an order of congress to inquire into the reasons of his failure, resigned 1778, June 14. In 1779 he was elected a member of congress, and from 1780 till his death was a member of the Conn. council.

SPEN'CER GULF: very large inlet on the coast of S. Australia (q.v.), between Eyria Peninsula on the w. and Yorke Peninsula on the e.; about 209 m. in length, by 100 m. in greatest breadth.

SPEND, v. *spĕnd* [AS. *spendan*, to spend, to consume: It. *spendere*, to spend: L. *dispendĕrĕ*, to weigh out—from *dis*, apart; *pendĕrĕ*, to weigh]: to lay out, as money; to dispose of; to consume; to waste; to squander; to exhaust; to fatigue; to pass, as time; to exert or exhaust, as force or strength; to be lost or wasted; to be consumed; in *OE.*, to effuse. SPEND'ING, imp.: N. act of laying out or expending. SPENT, pt. pp. *spĕnt:* ADJ. consumed; exhausted; deprived of its original force or qualities. SPEND'ER, n. *-ĕr*, one who spends. SPEND'THRIFT, n. *-thrĭft*, one who is improvident or reckless in the use of his means. SPENT BALL, a ball from a firearm which reaches an object so distant as to be deprived of sufficient force to penetrate it.

SPENER *spā'nĕr*, PHILIPP JAKOB: illustrious German reformer, founder of the sect known as PIETISTS (q.v.): 1635, Jan. 13—1705, Feb. 5; b. Rappoltsweiler (F. Ribeauville), Upper Alsace; son of a legal adviser to Count von Rappoltsweiler. S. early showed deep religious susceptibilities. After studying the classics at Colmar, he entered the Univ. of Strasburg 1651, where the professors Dannhauer and Seb. Schmidt inspired him with a profound love of the Scriptures, not as a heap of dry theological bones, but as a fountain of life and spiritual thought: there he studied especially philology, history, and philosophy. He then became private tutor to the princes of the Palatinate. 1659–62 he visited the Universities of Basel, Tübingen, Freiburg, Geneva, and Lyon. In the following year he became a preacher at Strasburg, where the unction of his sermons exercised a powerful influence on his hearers. At the age of 31, he was transferred to Frankfurt as first pastor; and here, as elsewhere, the profound spiritualism of the man, springing out of a free, simple, *un*theological faith in the Bible, made itself apparent in his preaching and life. Yet S. was the opposite of what is commonly called a *mystic*. The devotion which he sought to excite was not to show itself in transcendental ecstasies, amid which common-sense is apt to swoon away, but in acts of piety, humility, and charity. He had little love for the theology of his times, deeming it liable to develop into a hateful caricature of the free word of life; and he commenced 1670, at his house, meetings for cultivation of evangelical morality—the famous *collegia pietatis*, of great benefit to the German character in those days of stony and barren orthodoxy. He sought to improve the religious instruction given to children. In 1679 a preface which he wrote for a new edition of the *Postille* of Arndt, in which he censured the morals of the upper classes, aroused antagonism; and after a few years he was fain to accept the invitation to become court-preacher at Dresden, and member of the upper consistory. In this capacity he effected important ameliorations in the theological teaching of the Univ. of Leipzig, and in the system of religious

catechising throughout Saxony; but 1689 he fell into disgrace for having addressed a temperate but energetic remonstrance to the Elector Johann Georg III., concerning his personal vices; and being attacked by Carpzow, who coveted his place at court, and by other orthodox theologians, went to Berlin 1691 as provost of the Church of St. Nicholas, and consistorial inspector, offices which he retained to the end of his life. In Berlin he was held in high honor. The Elector of Brandenburg encouraged his efforts after religious reform, and intrusted theological instruction in the new Univ. of Halle (of which S. was practically founder) to Franke, Breithaupt, and other disciples of S. This excited great irritation in the theological faculties of Wittenberg and Leipzig, which (1695) had formally censured as heretical no less than 264 propositions drawn from S.'s writings. S. died at Berlin, leaving a reputation for piety, wisdom, and practical Christian energy which all the excesses of the later pietists have not obscured. Indeed, their errors and extravagancies in no wise characterized him. His chief divergence from the Lutheran faith of that time was his requirement of regeneration as essential for a theologian, and a tendency to literalism in prophetic interpretation. He did not insist that conversion should be a conscious crisis, but only that it is an actual change.—His writings are numerous; the chief are: *Pia Desideria* (Frankf. 1675); *Das geistliche Priesterthum* (Frankf. 1677); *Christliche Leichenpredigten* (13 vols. Frankf. 1677); *Des thätigen Christenthums Nothwendigkeit* (Frankf. 1679); *Klagen über das verdorbene Christenthum* (Frankf. 1684); *Evangelische Glaubenslehre* (Frankf. 1688), and *Theologische Bedenken* (Halle 5 vols. 1700–21). See Hossbach's *Phil. Jak. S. und seine Zeit* (1828, 3d ed. 1861); Wildenhalm's *Phil. Jak. S.* (Leip. 1842–47); Ritschl's *Geschichte des Pietismus* (Bonn 1884); Sachsse's *Ursprung u. Wesen des Pietismus* (Wiesbaden 1884).

SPENSER, *spĕn'sĕr*, EDMUND: poet; one of the chief literary ornaments of the great Elizabethan period about 1552–1599, Jan. 16; b. London. There is no certainty as to his family connection. In 1569 he went to Pembroke Hall, Cambridge, in the humble capacity of sizar. He remained several years, becoming bachelor of arts 1572, master 1576. After leaving college, he went to live with friends in n. England. Of the detail of his life at this period, nothing is known further than that he busied himself with poetry, his first volume of which, *The Shepheardes Calendar*, was published 1579. Its dedication to Sir Philip Sidney was the means of introducing him to that noble and kindly gentleman, who gave him both generous patronage and warm friendship. He seems to have been domesticated with Sir Philip at Leicester House, from which he dates his moiety of the *Foure Epistles*, exchanged between him and Gabriel Harvey, printed 1580. Toward the end of this year, through the influence of Sidney's uncle, the Earl of Leicester, an appointment was procured for S. as sec. to Lord Grey of Wilton, queen's

deputy in Ireland, whither he at once proceeded. About this time he began his immortal work, *The Faery Queen.* His official duties must have been punctually performed; as 1586 we find his services rewarded by a grant from the crown of Kilcolman in the county of Cork, an estate of more than 3,000 acres, on which he went to reside. At this time came the evil news to him of the death of his friend Sidney at Zutphen, which he musically bewails in the elegy *Astrophel.* Subsequently, the place of Sidney as patron and friend was in a measure supplied by Sir Walter Raleigh, who visited him in Ireland 1590, took him to England, and introduced him to Queen Elizabeth. His experiences as a suitor for court-favor seem not to have been very pleasant, if we may judge from a passage in one of his works.

The first three books of *The Faery Queen,* issued on his arrival in England 1590, were followed by three more 1591, and a collection of lesser pieces entitled *Complaints,* including *Mother Hubbard's Tale, The Tears of the Muses,* etc.; and 1596 by four *Hymns,* so called, in which the Platonic doctrine of Beauty is elaborated in noble music. In 1596 he wrote his *View of the State of Ireland,* a treatise full of sagacious observation, not published till long afterward (Dublin 1633). That the 'gentle poet' should after 14 years' residence in Ireland have framed and published so fierce and relentless a plan for the 'pacification' of that country as he urgently sets forth in this *View,* has caused great wonder. His plan amounted to this—that to the Irish, long turbulent and given to bloody feuds among themselves and risings against the government, there should be offered at once and for all the alternative of submission, or of extermination by sword and fire. This 'cruel' plan he urges as in the long run the most merciful. S.'s plan did not commend itself to the English authorities. In extenuation of it, it should be remembered that the times were brutal and that England was then in a struggle for existence against the great Roman Cath. continental powers.

After about 1591, nearly all record which survives to us of S., further than the dates of his publications, is summed in the facts, that he was married 1594; that he was made sheriff of Cork by the queen 1598; and that in the same year the disaster befell him which shortly preceded and may in part have caused his death. Tyrone's rebellion having broken out, S.'s house at Kilcolman was sacked and burned by the rebels, he and his wife with difficulty escaping, while their youngest child perished in the flames. Early the next year he died in London, and, as far as can be inferred from the account given by Ben Jonson to Drummond, in great destitution. He was buried at his own request near Chaucer in Westminster Abbey, at the expense of the Earl of Essex; who is said, in the account by Jonson, to have tendered him succor on his death-bed, though too late to be of avail.

S. takes admitted rank as one of the very greatest of English poets, and his chief work, *The Faery Queen,* writ-

ten in that stateliest of English measures since known as the *Spenserian Stanza* (see METER), tedious as it is in its allegory, and in much of its diction obsolete even when written, is a masterpiece of opulent genius. In the poetry of S., an ever-present thirst for and sense of beauty finds fit expression and reflex in a fluent succession of sweet and various cadences; in breadth and splendor of pictorial effect, it has never, perhaps, been surpassed: such lavish exuberance in detail has seldom been so combined with a total impression of chastened and majestic sobriety; and throughout it is pervaded by that atmosphere of moral wisdom and serenity which Milton reverently recognizes in 'the sage and serious Spenser.'—See *Spenser and His Poetry*, by Prof. G. L. Craik (3 vols. 1845). The most complete ed. of the poet's works is by Todd (Lond. 8 vols. 1806); a new ed., with glossary, notes, and life, by Collier, was pub. 1862. Church's short life of S. (1879) is admirable.

SPENSERIAN, a. *spĕn-sē'rĭ-ăn:* after the manner or model of *Spenser's* poetry, as in stanzas or measures: see METER.

SPERM, n. *spĕrm* [Gr. *sperma*, seed of any kind; *sper'-mătos*, of seed—from *speirō*, I sow]: animal seed; semen; the spawn of fishes. SPERM-CELL, a cell which impregnates, as opposed to a *germ-cell*, which is impregnated. SPERM-OIL, oil obtained from the spermaceti whale, chiefly from the head (see SPERMACETI). SPERMATIC, a. *spĕr-măt'ĭk*, or SPERMAT'ICAL, a. *-ĭ-kăl*, pertaining to or consisting of seed or semen; seminal. SPERMA'TIA, n. plu. *-mā'shĭ-ă*, in *bot.*, motionless spermatozoids in the conceptacles of fungi.

SPERM, n. *spĕrm:* contr. from SPERMACETI (q.v.).

SPERMACETI, n. *spĕr'mă-sē'tĭ* [L. *sperma cēti*, sperm of the whale: Gr. *sperma*, seed, and L. *cētus;* Gr. *kētos*, any large fish, a whale]: white, brittle, semi-transparent, waxy substance obtained in special cavities of the head of the sperm-whale, *Physeter macrocephalus:* see CACHALOT. It is separated from the oil, in which it is originally dissolved, by boiling water, from which the S. crystallizes as it cools. It is then purified by being remelted in a weak solution of potash, and the impurities skimmed off, and it is finally melted again by the action of steam, and cooled slowly in molds. Its specific gravity is 0·943; it is scarcely unctuous to the touch; does not melt under 100°; has little taste or odor; and occurs in pearly-white, glistening, translucent crystals. S. is an ether compound of cetyl alcohol combined with palmitic acid. It is an emollient and demulcent, hence a useful ingredient in cough-mixtures. Its chief use is external, as an ingredient in various ointments. The *Unguentum Cetacei*, or *Spermaceti Ointment*, of the Pharmacopœia consists of a mixture of S., white wax, and almond-oil. SPERMACETI WHALE, the species of whale from which spermaceti is procured; the sperm whale; the Cachalot (q.v.)

SPERMAGONES, n. plu. *spėr'mă-gōnz* [Gr. *sperma,* seed; *gonos,* offspring]: reproductive bodies in the form of very minute hollow sacs, found on the thallus of lichens; capsules or cysts in lichens and fungi, containing spermatia; also SPERMOGONES.

SPERMARIUM, n. *spėr-mā'rĭ-ŭm* [Gr. *sperma,* seed]: the organ in which spermatozoa are produced.

SPERMATHECA, n. *spėr'mă-thē'kă* [Gr. *sperma,* seed; *thēkē,* a receptacle]: a receptacle or sac in which ejected semen is stored up, as in some insects.

SPERMATIA, SPERMATIC. See under SPERM.

SPERMATOLOGY, n. *spėr'mă-tŏl'ŏ-jĭ* [Gr. *sperma,* seed, *spermatos,* of seed; *logos,* discourse]: a treatise on sperm, or the fecundating fluid. SPER'MATOPH'ORA, n. plu. *-tŏf'ōră,* or SPERMATOPHORES, n. plu. *spėr-măt'ŏ-fōrz* [Gr. *phorĕō,* I bear]: cases in which bundles of the spermatozoa are packed. SPER'MATOPH'OROUS, a. *-ō-rŭs,* producing or bearing seed or sperm.

SPERMATOZOIDS, n. plu. *spėr'mă-tō-zō'ĭdz* [Gr. *sperma,* seed; *eidos,* form]: in *anat.,* same as SPERMATOZOA; in *bot.,* moving filaments analogous to the spermatozoa of animals and contained in the antheridia of cryptogams—more commonly called *antherozoids.* SPER'MATOZO'ON, n. *-tō-zō'ŏn,* plu. SPER'MATOZO'A, *-zō-ă* [Gr. *zōon,* an animal]: in *anat.,* the true fertilizing agents developed in the male generative organs. They appear to be formed from the epithelial lining of the tortuous seminal tubes, of which the organ known as the *testis* is essentially composed. At the period of puberty in man, and at certain periods annually in other animals, the seminal tubes are seen to be filled with cells, from which the spermatozoa are developed. Various changes ensue, and the spermatozoa are finally set free by the bursting of the cell-walls, and arrange themselves in parcels, symmetrically placed, with the so-called heads in one direction, and the tails in the opposite direction. In the human subject, the spermatozoa may be described as clear, hyaloid bodies occurring in the semen, each of which consists of a dilated portion, the head or body, from which a long tail, or filament, issues. The head is flattened from side to side, and of conical form, the pointed extremity being anterior. The length of the spermatozoa is about $\frac{1}{800}$ of an inch. The spermatozoa of different animals vary extremely in size and form. It was formerly supposed that spermatozoa were independent organisms (like the infusoria), but it is now known that they must be regarded as cells endowed with special properties.

SPERM-WHALE. See CACHALOT.

SPEW, v. *spū* [AS. *spiwan;* Dut. *spuuwen;* Ger. *speien;* L. *spuĕrĕ,* to spit]: to vomit; to eject from the stomach. SPEW'ING, imp.: N. act of vomiting. SPEWED, pp. *spūd.*

SPEY, *spā:* river of Scotland, rising in s. Inverness-shire, 6 m. n.w. of Loch Laggan, 10 m. e. of Loch Lochy; flowing n.e. through the counties of Inverness and Elgin, and, after a course of about 110 m., falling into the Moray Firth, 3 m. w. of Port-Gordon. During a portion of its lower course, it is the boundary between the counties of Elgin and Banff. In length, it is the second river of Scotland; but except for its very profitable salmon-fisheries, it is of little value; and it is not picturesque.

SPEZIA, *spā'dzē-â:* city of n. Italy, province of Genoa, 60 m. s.e. of the city of Genoa, near the inner point of the Gulf of Genoa. It is the principal naval station and arsenal of the kingdom of Italy. The Gulf of Spezia, anciently Gulf of Luna, is formed by the bifurcation of a spur of the Apennines, and is 3½ m. long, and 3 m. broad; its w. shore is indented by many coves or creeks, five of which—Porto-Venere, La Castagna, the Varignano (the quarantine-station), Grazie, and Panigaglia—are so deep that large men-of-war may be moored in them. A breakwater stretches across the gulf from Point Santa Maria to Point Santa Teresa—7,220 ft. The arsenal is in size about 4,000 by 2,400 ft. The place is strongly fortified. The shipping and commerce of Spezia are considerable. The scenery of the gulf is beautiful, and the mildness of its climate was famous in ancient times. The soil produces olives, excellent wines, fruits, etc.; and the town is a much-frequented watering-place. There are numerous foreign consulates. Steamers perform the voyage from Spezia to Genoa in eight hours. Spezia is on the Genoa and Pisa Ry.—Pop. 63,163.

SPEZZIA, *spĕt'sē-â* (anc. *Pityussa*, or, according to some scholars, anc. *Haliassa*): small Greek island at the entrance to the Gulf of Nauplia. The island is unfruitful, and its people are engaged chiefly in commercial pursuits. The town of Spezzia, on the n. coast, has more than 6,500 inhabitants.—Pop. of island, 12,000.

SPHACELATE, v. *sfăs'ĕ-lāt* [Gr. *sphak'ĕlŏs*, mortification, gangrene]: to affect with gangrene; to mortify; to decay and become carious, as a bone. SPHAC'ELATING, imp. SPHAC'ELATED, pp.: ADJ. affected with gangrene; mortified. SPHAC'ELA'TION, n. *-lā'shŭn*, the process of becoming gangrenous; mortification. SPHAC'ELUS, n. *-lŭs*, in *med.*, complete mortification; dead and disorganized tissue thrown off from a part; slough.

SPHÆRAPHIDES, n. plu. *sfē-răf'ĭ-dēz* [Gr. *sphaira*, a globe; *rhaphis*, a needle; *rhaphĭdŏs*, of a needle]: in *bot.*, globular clusters of raphides, or globular aggregations of minute crystals, as found in phanerogamous plants.

SPHÆRENCHYMA, n. *sfē-rĕng'kĭ-mă* [Gr. *sphaira*, a sphere or globe; *engchuma*, the substance of organs, an infusion—from *en*, in; *cheō*, I pour]: in *bot.*, vegetable tissue composed of spherical cells.

SPHÆROSIDERITE, n. *sfē'rō-sĭd'ĕr-īt* [Gr. *sphaira*, a sphere; *sidēros*, iron]: a term applied to grape-like or kidney-shaped concretions of sparry carbonate of iron.

SPHÆRULARIA, *sphēr-ū-lā'rĭ-a* [L.—from *sphæruum*, dim. of *sphæra*, sphere]: remarkable nematode, or round worm, a parasite in various species of bees. The female is almost an inch in length, has nearly uniform diameter of $\frac{1}{15}$ of an inch, is of whitish color, is bluntly pointed at each end, and is covered with numerous (about 800) small button-like projections—a peculiarity to which it owes its name. There is neither mouth, œsophagus, intestine, nor anus; and the whole animal consists of little more than an elongated mass of fatty tissue and reproductive organs, which in full-grown individuals contain ova in various stages of development. Although the female was discovered 1836 (by Leon Dufour), it was not until 1861 that the discovery of the male was announced by Lubbock in his memoir on this parasite. The male had been overlooked because it is more than 28,000 times smaller than the female: it is frequently found sexually united to the female, as occurs in *Sclerostoma syngamus* (q.v.), the parasite which gives rise to the *Gapes* in various birds.

SPHÆRULITES, n. plu. *sfē'rū-līts* [Gr. *sphaira*, a sphere; *lithos*, a stone]: in *geol.*, a cretaceous genus of thick subconical shells, having opercular-looking upper valves; a variety of obsidian or pearl-stone, found in small rounded grains.

SPHAGNUM, n. *sfăg'nŭm* [Gr. *sphagnos*, a kind of moss]: kind of moss found in bogs. SPHAGNOUS, a. *sfăg'nŭs* mossy; pert. to bog-moss called sphagnum.—*Sphagnum* is a genus of mosses, whose spore-case is an urn closed by a deciduous lid, its brim toothless, the calyptra irregularly torn. The species are very numerous, and are distributed throughout the temperate latitudes, being very common in bogs—hence their popular name, *Bog-moss*. There are about 25 N. Amer. species. All the members of the genus are very elegant plants. They often grow in considerable masses, absorbing water like a sponge, but becoming friable when dry. They contribute much to the formation of peat. Gardeners employ them in preference to other mosses for covering and keeping moist the roots of plants, as they have in a high degree the property of absorbing moisture from the atmosphere. They have been used as food in barbarous countries, but are very slightly nutritive. The cells of the leaves are remarkable for their spiral structure, and for large pores in their sides. Sphagnum continues to grow at the top while at a certain depth below its life ceases; and thus it gradually fills up the depression of pools and swamps, retaining earthy matter and building up arable levels.

Sphagnum.

SPHALEROCARPIUM, n. *sfăl'ĕr-ō-kär'pĭ-um* [Gr. *sphalĕros*, unsteady, faithless—from *sphallō*, I trip up; *karpos* fruit]: in *bot.*, a small indehiscent, one-seeded fruit, inclosed within a fleshy complex pericarp.

SPHEGIDÆ, *sfē'jĭ-dē*, or SPHECIDÆ, *sfē'sĭ-dē* [Gr. *sphex*, wasp, and *-idæ*]: family of fossorial hymenopterous insects, winged in both sexes, much resembling bees or wasps in appearance. They are solitary in their habits. Many burrow in sand, and are known as *Sand-wasps*, or *Digger-wasps*. They are extremely active and restless, and may be seen running about on sand-hills, with wings in constant motion. Some carry spiders, and others caterpillars, into their burrows, as food for their larvæ, placing them there when the egg is laid, and stinging them, thus rendering them torpid without killing them. They show wonderful energy and perseverance in dragging the spider or caterpillar to the burrow. They are mostly tropical insects. Of the genus *Sphex*, about 12 species are found in the United States.

SPHENE, n. *sfēn* [F. *sphène*—from Gr. *sphēn*, a wedge]: a mineral composed of silica, titanic acid, and lime.

SPHENIS'CIDÆ: see PENGUIN: AUK.

SPHENO-, prefix, *sfēn-o* [Gr. *sphēn*, *sphēnos*, a wedge]: pertaining to or resembling a wedge in shape.

SPHENOCEPHALUS, n. *sfēn'ō-sĕf'ă-lŭs* [Gr. *sphēn*, a wedge; *kephalē*, the head]: in *anat.*, a malformation of the head by which the upper part of the cranium takes a wedge-like appearance.

SPHENOGRAM, n. *sfēn'o-grăm* [prefix *spheno-*; Gr. *gramma*, a writing, a letter]: a cuneiform or arrow-headed character (see CUNEIFORM). SPHENOGRAPHER, n. *sfēn-ŏg'ra-fĕr*, one who is skilled in sphenography, or the deciphering of cuneiform inscriptions. SPHENOG'RAPHY, n. *-fĭ* [prefix *spheno-*; Gr. *graphō*, I write]: act or art of writing in cuneiform or arrow-shaped letters or characters; the art of deciphering cuneiform writings.

SPHENOID, a. *sfē'noyd*, or SPHENOIDAL, a. *sfē-noyd'ăl* [Gr. *sphēn*, a wedge, *sphēnos*, of a wedge; *eidos*, likeness: F. *sphénoïde*]: wedge-like, as applied to a bone of the skull which wedges in and locks together most of the other bones. *Sphenoid*, often contracted into SPHENO, *sfē'nō*, signifies, belonging both to the sphenoid bone and to the part indicated by the other constituent of the compound, as *spheno-maxillary*. The *Sphenoid Bone* is at the anterior part of the base of the skull, and articulated with all the other cranial bones, which it wedges firmly together. It somewhat resembles a bat with wings extended, hence was termed the *Os respertilionis*. It is divisible into a body, the greater and lesser wings, and various processes. The greater wings present three surfaces: a superior or cerebral surface, forming part of the floor on which the brain rests; an anterior surface, which assists to form the outer part of the orbit of the eye; and an external surface with a rough ridge, giving attachment to the external

pterygoid muscle, one of the most powerful muscles of mastication. The 2d, 3d, 4th, 5th, and 6th cranial nerves emerge from the cranial cavity through foramina in this bone. Although considered in human anatomy as a single bone, it may be regarded as composed of several bones, which, after a time, unite with one another, as the basi-sphenoid, the pre-sphenoid, the ali-sphenoid, and the orbito-sphenoid bones: see SKULL.

The Upper or Cerebral Surface of the Sphenoid Bone.

1, The olivary process; 2, the ethmoidal spore; 3 and 4, the lesser and greater wings on the left side; 6, the extremity of left pterygoid process; 7, the foramen for the optic nerve; 10, the sella turcica on which the pituitary gland rests; 12, the basilar portion of the bone, joining with the occipital; 13, part of the sphenoidal fissure which separates the greater from the lesser wings, and transmits the 3d, 4th, the ophthalmic division of the 5th, and the 6th nerves, with the ophthalmic vein; 14, the foramen rotundum, transmitting the second division of the 5th nerve; 15, the foramen ovula, transmitting the third division of the 5th nerve; 16, the foramen sponosum for the passage of the middle meringeal artery.

SPHERE, n. *sfēr* [F. *sphère*—from L. *sphæra;* Gr. *sphaira*, a ball, a globe: comp. Gael. *speur*, the sky]: the vast concave or expanse of the heavens; a globe; a celestial orb; a circle: in *geom.*, round solid figure (see below): any round or approximately round solid body: employment; rank; circuit of action; knowledge or influence: V. in *OE.*, to place in a sphere; to form into roundness. SPHERICAL, a. *sfĕr'ĭ-kăl*, round; globular; relating to a sphere. SPHER'ICALLY, ad. *-lĭ*. SPHER'ICALNESS, n. *-nĕs*, or SPHERICITY, n. *sfĕ-rĭs'ĭ-tĭ*, state or quality of being round; roundness. SPHERICLE, n. *sfĕr'ĭ-kl* or SPHERULE, n. *sfĕr'ūl*, a little sphere. SPHER'ICS, n. plu. *-ĭks*, doctrine of the properties of the sphere as a geometrical body, in relation to the different circles, lines, angles, etc., which may be described on its surface. SPHERY, a. *sfē'rĭ*, in *OE.*, spherical; round; belonging to the spheres. SPHERICAL ANGLE, in *trig.*, angle formed by the intersection of two great circles on the surface of a sphere or spheroid. SPHERICAL GEOMETRY, branch of geometry that treats of spherical bodies and their various properties. SPHERICAL TRIGONOMETRY, branch of trigonometry which treats of spherical angles and triangles. MUSIC OF THE SPHERES, in *anc. astron.*, music imagined to result from or to attend the rhythmic motions of the spheres.—SYN. of 'sphere, n.: globe; globule; orb; ball.

SPHERE, in Geometry: regular solid figure, every point of whose surface is equally distant from its centre; its outline is traced by a circle revolving round its diameter. All sections of a sphere by a plane are necessarily circles, and all sections by planes passing through the centre, or by planes cutting the sphere at equal distances from the centre, are equal. The former sections are called *great,* the latter *small, circles.* Small circles may vary in size between a mere point and a great circle, approaching either limit however nearly. The surface of a sphere is equal to that of four of its great circles, or (taking x for the radius of the sphere) to $4\pi x^2$; and its volume to that of a cone whose altitude is twice that of the sphere, or $4x$, and whose base is a great circle of the sphere, the formula for it being $\frac{4x}{3} \times \pi x^2$, or $\frac{4}{3}\pi x^3$. The most remarkable geometrical property of the sphere is the relation, discussed by Archimedes, which its surface and volume bear to those of the 'circumscribing' cylinder, i.e., a cylinder whose length and diameter of each end are each equal to the diameter of the sphere, and in which, therefore, the sphere will be exactly contained. The concave surface of such a cylinder is exactly equal to the surface of the sphere; and not only so, but if a section parallel to the base of the cylinder be made through both cylinder and sphere, the curved surfaces of the portions cut off are equal, whether such portion be cut off from one end or be intercepted between two parallel sections: it follows from this that the curved surface of any section of a sphere with parallel ends is equal to the product of the circumference of a great circle of the sphere by the height or thickness of the section, and that the curved surfaces of all such sections of a sphere are proportional to the thickness of such sections. The volume of the sphere, also, is equal to two-thirds of that of the circumscribing cylinder.

SPHEROGRAPH, n. *sfĕr'ō-grăf* [Gr. *sphaira,* a sphere; *graphō,* I write]: simple and efficient instrument for mechanical solution of problems in spherical trigonometry presented by navigation, geography, etc., invented 1856 by Stephen Martin Saxby, of the British navy. It consists of two circular pieces of paper, the whole of the under and the rim of the upper being of stout card-board, and the interior portion of the upper one of strong transparent tracing-paper; these two circles are attached by a pin through their common centre, the pin being made to work in an ivory collar, to prevent any lateral motion of either circle. Round the pin as centre, equal circles are drawn, one on each sheet; each circle is then filled in with lines representing meridians and parallels according to the stereographic projection; and the chart is complete. Fig. 1 represents the appearance presented by the spherograph when the two poles are separated by an angular.

distance of 40°; the lines drawn on the under circle (represented by *dotted lines* in the fig.) showing through the

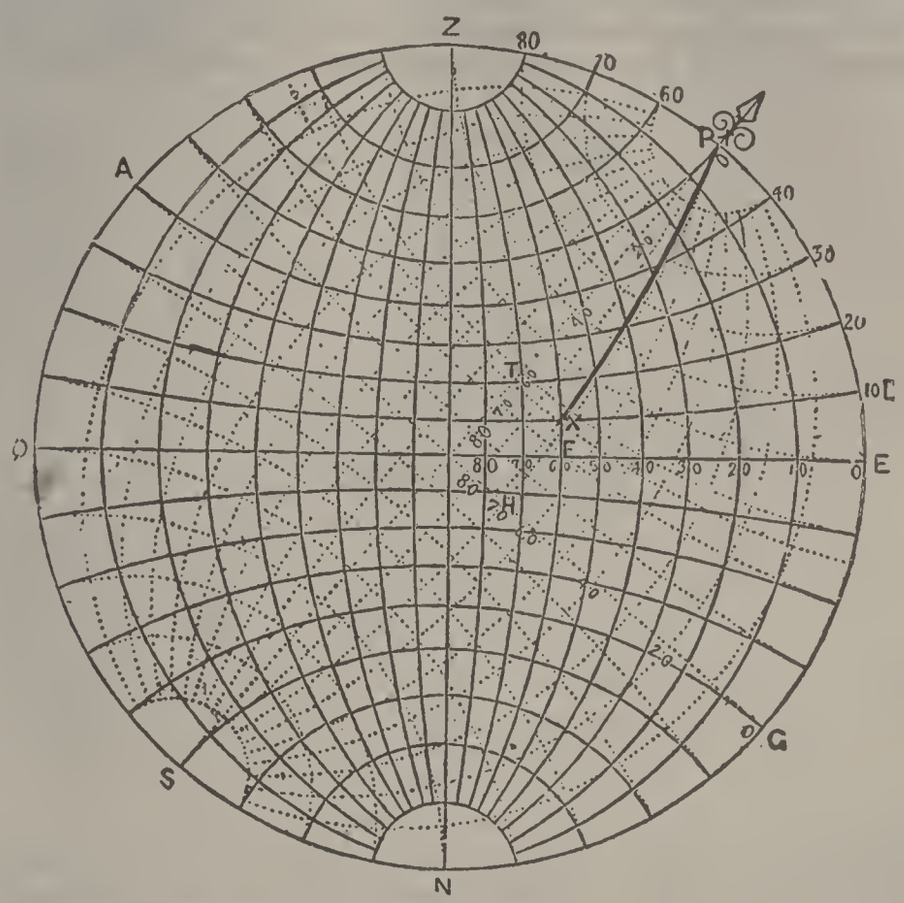


Fig. 1.

transparent paper which forms the upper circle, on which the continuous lines are delineated. Suppose, then, that a ship is in lat. 50° n., long. 20° w., and is bound for a point in lat. 10° n. and long. 80° w.; and that its great circle track, etc., are required: let P, the pole of the under circle, represent the place of the ship (the circle ZPD always representing the meridian of the point of departure, and the upper circle, whose pole is Z, representing the earth's hemisphere) which is done by turning the upper circle till P appears at lat. 50° n.; X represents the point to be arrived at, consequently PX, the arc of a great circle passing through P and X, is the great circle track, PD is the difference of lat., EF the difference of long.; the spherical angle XPD, measured by GH, an arc of a great circle, of which P is the pole, is the course; and the length of PX is measured by PT, the portion of PS which is cut off by a parallel of the under circle through X, in degrees. The data, then, being as above, we find by inspection of the instrument the difference of lat. = 40° s., the difference of long. = 60° w., the course = s. 72¾° w., and the distance = 63⅓° = 3,800 nautical m. Besides saving of time and labor by the use of this instrument—the whole work being the *setting* of the instrument, and then the reading off of the required elements—it is evident that the substitution of a mechanical solution for calculation greatly lessens the probability of error. It is found that spherographs of 5

inches radius give results of sufficient accuracy for all purposes of the navigator.

All other spherical problems can be solved with equal facility by this instrument; but one more example will suffice. Let Z (fig. 2) now represent the zenith of a place,

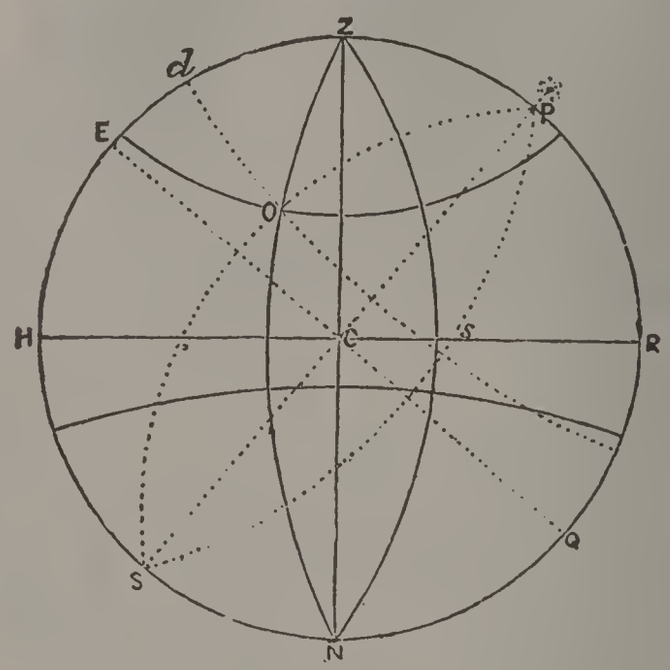


Fig. 2.

ZHNR its meridian. P the n. pole of the heavens; the other lines are then circles of declination, altitude, azimuth, and hour circles; and let O represent the place of the sun in given declination and altitude at a certain time. The instrument is now set by turning round the upper card till the point O (determined by its circle of declination and hour circle) on the under card falls upon the circle of given altitude on the upper card; then *d* is the sun's place at noon, H*d* being his meridian altitude, PR the latitude of the place, the angle RPS (measured in degrees along QE) the time of sunset, *ds* half the length of the day, *sc* half the length of the night, etc. The spherograph is useful also in finding latitude when the horizon is hid by fogs, right ascensions at night, and correcting lunar observations; but for these purposes, spherographs are specially constructed, as some slight variations in the form given above are necessary.

SPHEROID, n. *sfēr'oyd* [Gr. *sphaira*, a sphere; *eidos*, resemblance]: round body or figure not perfectly spherical; a solid generated by the revolution of an ellipse about one of its axes (see below). SPHEROIDAL, a. *sfēr-oyd'ăl*, having the form of a spheroid (see SPHEROIDAL CONDITION). SPHEROID'ALLY, ad. *-lĭ*. SPHER'OIDIC'ITY, n. *-oy-dĭs'ĭ-tĭ*, state or quality of being spheroidal. OBLATE SPHEROID see under OBLATE 1.

SPHER'OID: species of Ellipsoid (q.v.), and represented by the same equation. If an ellipse be made to revolve round one of its axes, the curved outline of the ellipse describes the S. Should the major or longer axis be the axis of revolution, the S. is said to be *prolate* (Lat. *prolatus*, lengthened); but if the minor or shorter axis, *oblate*. As the earth's axis of revolution, which runs from pole to pole, is about 25 m. shorter than the longest or equatorial diameter, and as these diameters are at right angles to each other, the earth is considered an oblate spheroid.

SPHEROID'AL CONDITION of Liquids: state assumed by liquids when placed on a highly heated surface. The singular phenomena presented by liquids in this condition were discovered by Leidenfrost, but carefully investigated first by Boutigny. Indeed, one, at least, of these phenomena has been popularly known for a very long time, being the foundation of the rough practical method of determining whether or not a flat-iron is so hot as to be likely to singe the linen to which it is to be applied. The test consists simply in letting a drop of water fall upon the iron: if it be not too hot, the drop spreads over the surface and evaporates: if it be too hot, the drop at once glances off the iron without wetting it.

The common experimental method of exhibiting the S. C. is easily performed thus: A metallic disk, slightly concave, like a watch-glass, is heated by a lamp, and water is cautiously dropped on it from a pipette. If this be done before the disk is sufficiently heated, the water boils almost explosively, and is dispersed at once in vapor. But when the disk is hot enough, the water remains suspended, as shown in the cut, *above* the surface; and the drop, when small, takes nearly the form of an oblate spheroid. Various proofs have been given, though they are obviously unnecessary, that there is no contact in this case. Thus, if the disk be very nearly flat, light passes freely between it and the drop. Again, if one pole of a galvanic battery be connected with the disk, and the other be dipped into the drop, a galvanometer interposed in the circuit shows that no current passes. By heating the disk sufficiently, and dropping on the water very carefully, we may easily keep in the spheroidal state as much water as, if not more than, the disk could hold when cold. The explanation of the phenomenon is not yet clear; but there is no doubt that the radiant heat from the disk raises vapor so freely from the surface of the drop nearest it as to interpose a cushion of dense and highly-heated vapor between them, on which the drop, as it were, floats; the pressure of the vapor balancing its weight. This is not, however, a quite complete explanation of the experiment, and it would require too much detail to examine it more closely. But the most curious fact connected with the experiment is that the water does *not* boil. In fact, it evaporates so freely that the heat carried off from it, as latent heat, by the vapor which is constantly

formed, keeps its temperature somewhere about 206° F. only. This suggests a curious experiment, which is found to succeed: *Boiling* water, dropped on a red-hot plate of metal, instantly assumes the spheroidal state, and is *cooled* six degrees below boiling. It is not necessary that a metal plate be used—a watch-glass will suffice for the experiment; but *hot* water must be dropped on it, or the glass will crack.

Other liquids, and even some bodies solid at ordinary temperatures, can be easily brought into the S. C.—the lowest requisite temperature of the disk being dependent on the boiling-point of the substance. Thus, while water has a temperature of 206° F. in the S. C., the disk must have a temperature of 340° F. at least—for alcohol, these temperatures are 168° F. and 270° F.—for ether, 94° F. and 140° F. A good example of a solid entering this state is furnished by dropping crystals of iodine on a hot platinum disk. It is not necessary that the disk be solid: it is easy to obtain ether, and even water, in the S. C. over the surface of hot oil—but great care is required, as explosions are apt to occur, in which case the hot oil is freely thrown about.

Many cases of bursting of steam-boilers, otherwise apparently inexplicable, seem attributable to this condition of matter. Thus, if the water-supply has run low, and the boiler has been overheated, it is conceivable that the contents may sometimes be in the S. C. The addition of cold water, in such a case, would bring them suddenly *in contact with* the overheated metal, and the large quantities of steam thus violently generated might burst the boiler.

A very singular experiment, the freezing of water on a red-hot plate, is easily performed by the help of this property of matter. Liquid sulphurous acid is so volatile as to have a temperature of 13° F. only, when in the S. C. As this is 19° under the freezing-point of water, if a little water be dropped into the spheroid of acid it is at once frozen, and the pellet of ice can be dropped on the hand from the still red-hot plate. Even mercury can be frozen by a similar process; but as much greater cold is required, the substance in the S. C. is a mixture of solid carbonic acid and ether.

The hand may be dipped for a very short time with impunity into melted lead, and even into melted copper. The vapor, instantly raised from the moisture of the skin, prevents, so long as that moisture lasts, more than an endurable amount of radiant heat from reaching the hand; also it prevents direct contact. It is probable that a knowledge of some forms of this phenomenon, in old days, was employed by priestcraft for protecting, when desirable, the victims of the Ordeal (q.v.) by fire. The phenomenon may easily be reversed. Thus, a red-hot silver ball dropped into a vessel of water is seen to glow for some time, till it has so far cooled that the water comes into contact with it, when we have, as in the other form of the experiment, an immediate and violent formation of vapor. The success of this experiment is greatly aided by addition of some strong ammonia to the water.

SPHEROMETER, n. *sfĕr-om'ĕ-tĕr* [Gr. *sphaira,* a sphere; *metron,* a measure]: instrument for measuring the radii of a sphere. It consists of a 3-armed frame standing on 3 steel pins exactly equidistant and of exactly equal height, with vertical screw (ending in a point below) working in a socket at the intersection of the 3 arms. At one side is a fixed scale, and the large head of the screw is graduated on the rim. By the aid of this graduation and the fixed scale, it is possible to determine with precision the distance between the extremity of the screw and the plane passing through the contact-points of the steel pins with the spherical surface under examination.

SPHEROSIDERITE. See SPHÆROSIDERITE.

SPHERULITES. See SPHÆRULITES.

SPHINCTER, n. *sfĭngk'tĕr* [Gr. *sphingktēr,* that binds tightly or contracts—from *sphinggō,* I bind tight]: in *anat.,* a muscle that contracts or closes an orifice or opening which it surrounds. Sphincter Muscles are circular bands of muscular fibres, whose function is to antagonize the expellent action of certain viscera, especially the bladder and the lower part of the rectum. It is to the presence of these muscles that the higher animals owe the power of retaining for a considerable period the excrementitious matters collected in the bladder and rectum, and of discharging them at intervals, the sphincter muscles being, like those engaged in the process of respiration, mainly, though not entirely, under control of the will. Under certain conditions the necessity for expelling the contents of these viscera becomes so urgent that the ordinary voluntary power of the sphincters is overcome, or they may lose their power through paralysis.

SPHINX, n. *sfĭngks* [L. *sphinx;* Gr. *sphingx,* the sphinx, the throttler—from Gr. *sphinggō,* I bind tight]: in anc. myth., a fabulous and terrible monster, mentioned first in Hesiod; described as having a lion's body, woman's head, bird's wings, and serpent's tail—ideas which originated probably in Phœnicia, which had adopted this symbolical form into the mythology from Egypt. She was fabled to be the issue of Orthos the two-headed dog of Geryon, by Chimæra (see CHIMERA); or Typhon and Echidna. This was the *Sphinx of Thebes* in Bœotia, said to have been sent into the vicinity of Thebes by Juno, to punish the transgression of Laius; or according to other accounts, sent by Bacchus, Mars, or Pluto: see ŒDIPUS. She was said to propound riddles to travellers, and tear to pieces those who could not solve them. Thence the term sphinx came to have its modern application to one who talks in enigmas.—Sphinx is also the generic name of the hawk-moths, so called because the attitude of the caterpillar resembles that of the Egyptian sphinx.

Sphinx in general is the name given to a compound creature of Egyptian and Greek art and mythology. The

Sphinxes have the body of a lion, a human or an animal head, and two wings attached to the sides. Various other combinations of animal forms have been called by this name, though they are rather griffins or chimeras. Human-headed Sphinxes have been called androsphinxes; one with the head of a ram, a criosphinx; with a hawk's head, a hieracosphinx. The form, when complete, had wings added at the sides; but these are of a later period, and seem to have originated with the Babylonians or Assyrians. In the Egyptian hieroglyphs, the S. bears the name *Neb*, or Lord, and *Akar*, or Intelligence; corresponding to the account of Clemens, that these emblematic figures symbolized intellect and force. The notion that they allegorized the overflow of the Nile when the sun was in the constellations Leo and Virgo, appears unfounded. In Egypt, the S. appears also as the symbolical form of the monarch considered as a conqueror, the head of the reigning king being placed on a lion's body, the face bearded, and the usual dress-drapery being suspended before it. Thus used, the S. was usually male; but in the case of female rulers, the figure has a female head, and the body of a lioness.

Greek Sphinx, from a sculpture in British Museum.

Egyptian Sphinx, Louvre Museum.

The most remarkable S. is the Great S. at Gizeh, a colossal form, hewn out of the natural rock, 300 ft. e. of the second pyramid. It is sculptured out of a spur of the rock, to which masonry has been added in certain places, to complete the form; and measures 172 ft. 6 in. long by 56 ft. high. Immediately in front of the breast, Caviglia found, 1816, a small naos, or chapel, formed of three hieroglyphical tablets, dedicated by the monarchs Thothmes III. and Rameses II. to the S., whom they adore under the name Hor-em-akhu, i.e., 'Horus in the Horizon.' These tablets formed three walls of the chapel; the fourth wall in front, had a door in the centre, and two lions couchant upon it. A small lion was found on the pavement, and an altar between its fore-paws, apparently for sacrifices offered to it in the time of the Romans. Before the altar was a paved esplanade or dromos, leading to a staircase of 30 steps placed between two walls, and repaired in the reigns of M. Aurelius and L. Verus, 166, May 10. In the reign of

Severus and his sons, 199–200, another dromos, in the same line as the first, and a diverging staircase, were made; and some additions were found to have been made to the parts between the two staircases in the reign of Nero. Votive inscriptions of the Roman period, some as late as the 3d c., were discovered in the walls and constructions. On the second digit of the left claw of the S. was discovered an inscription, in pentameter Greek verses, by Arrian, probably of the time of Severus. Another metrical and prosaic inscription was found. In addition to these walls of unburnt brick, galleries and shafts were found in the rear of the S., extending northward. The excavations, however, of Mariette-Bey, 1852, have thrown further light on the S., discovering the peribolos, or outer

View of the Great Sphinx during the excavations of Caviglia, 1816.
From Colonel Vyse's *Pyramids of Gizeh.*

wall that encircled it; discovering that the head only was sculptured; and that the sand which had accumulated round it was brought by the hands of man, and not an encroachment of the desert; also that the masonry of the belly was supported by a kind of abutment. South of the S. Mariette found a dromos which led to a temple of the time of the fourth dynasty, of huge blocks of alabaster and red granite. In the midst of the great chamber of this temple were found seven statues, five mutilated and two entire, of the monarch Shaf-ra or Cephren, of a porphyritic granite: they are fine examples of ancient Egyptian art. While the beauty and grandeur of the Great S. have often attracted the admiration of travellers, its age has always been a subject of doubt; but these later discoveries prove it a monument of the age of the 4th dynasty, or contemporary with the Pyramids (q.v.).

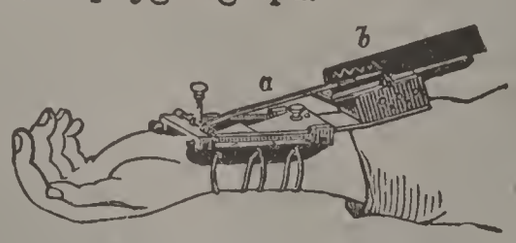
Besides the Great S., avenues of Sphinxes have been discovered at Saqqarah, forming a dromos to the Serapeium of Memphis; and another dromos of the same at the Wady Esseboua. A S. of the age of the Shepherd dynasty has been found at Tanis, another of the same age is in the Louvre; and a granite S., found behind the vocal Memnon, and inscribed with the name of Amenophis III., is at St. Petersburg. An avenue of criosphinxes has been found at Karnak; each figure is about 17 ft. long, and of the age of Horus, one of the last monarchs of the 18th dynasty. Several small Sphinxes are in various European collections, but none of very great antiquity.—There were other colossal S. figures in Grecian lands, all having women's heads. One of these Sphinxes stood on the sacred road near Miletus in Ionia; another in the temple at Assus. Small figures of Sphinxes have been found at Curium in Cyprus, Mycenæ, Camirus in Rhodes, and elsewhere.—The S. was a favorite subject of ancient art; appearing in bas-reliefs, on medals of Chios and other towns, and often as the decoration of arms and furniture. In Assyria and Babylonia, representations of Sphinxes have been found, and they are frequent on Phœnician works of art.

Birch, *Mus. of Classic. Antiquit.*, II. 27; *Quart. Rev.*, XIX. 412; Vyse, *Pyramids*, III. 107; Young, *Hieroglyphicks*, pl. 80; Letronne, *Inser. Grecq.*, II. 460; *Rev. Arch.*, 1853. p. 715; 1860, p. 20; *Schol. Euripid.*, I. 1, 1134; Hesiod, *Theog.*, 326; Creuzer, *Symbolik*, I. 495; Millin, *Gal. Myth.*, 502, 505; Cesnola, *Cyprus*, p. 110 *seq.*, 263 *seq.*; Schliemann, *Mycenæ*, pp. xiv., 184.

SPHRAGISTICS, n. *sfrăj-jĭs'tĭks* [Gr. *sphragis'tĭkos*, of or for sealing—from *sphragis*, a seal]: the science of seals, their history, peculiarities, and distinctions, in relation to documents.

SPHRIGOSIS, n. *sfrĭ-gō'sĭs* [Gr. *sphrigaō*, I am vigorous]: in *bot.*, the disease of over-rankness, either constitutional or the effect of abundant nutriment, from which many members of the vegetable kingdom suffer.

SPHYGMIC, a. *sfĭg'mĭk* [Gr. *sphugmos*, the pulse]: of or pertaining to the pulse. SPHYG'MOGRAPH, n. *-mō-grăf* [Gr. *graphō*, I describe]: contrivance for indicating the character of the pulse (see below). SPHYG'MOGRAPH'IC, a. *-grăf'ĭk*, connected with or relating to a sphygmograph. SPHYGMOMETER, n. *sfĭg-mŏm'ĕ-tĕr* [Gr. *metron*, a measure]: instrument for rendering visible arterial pulsations, or for counting them; a sphygmograph.



Marey's Sphygmograph.

SPHYGMOGRAPH, *sfĭg'mō graf*: instrument for ascertainment and permanent record of the form, force, and

frequency of the pulse-beat, and the changes which that beat undergoes in certain morbid states. This instrument consists of two essential parts: the first part comprises two levers, one of which is so delicately adjusted on the vessel whose pulsation is to be examined, that on each expansion of the vessel the lever undergoes a corresponding slight elevation: this lever communicates by a perpendicular arm with a second, to which it transmits the impulse received from the vessel; the extremity of this second lever is armed with a pen-point, which records the movements thus indicated on a movable plate, controlled by the second part of the instrument. The second part consists of a plate, moved by watch-work, and bearing a strip of paper on which the *sphygmographic* tracery is formed.

Mode in which the Tracery is formed.—As the pulse transmits through the levers a vertical movement to the pen-point, and the plate, on which the tracery is formed, is moved steadily across the pen-point, and undulating line (fig. 1) is the result: the *height* of the elevations indicating the strength of the pulse; and the *number* of the elevations delineated in the time the pen takes to travel, its frequency.

Figs. 1, 2, and 3 are fac-similes of sphygmographic tracings: of these, fig. 1 is the tracing presented by a natural pulse; figs. 2 and 3 are morbid. The latter are excellent examples of the tracings produced by the pulse at

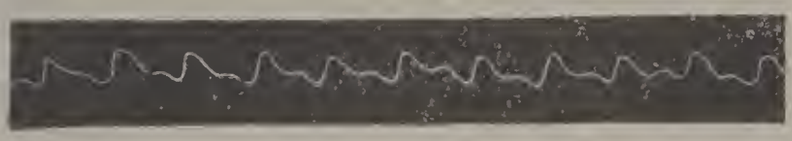


Fig. 1.

the wrist in two common forms of cardiac disease, and exhibit the manner in which the tracing is modified in diseased states of the circulatory system. Fig. 2 represents the pulse of a patient suffering from an incompetent state of the valves guarding the orifice of the aorta, the great vessel conveying blood from the heart. The blood, in such a case, when propelled into the aorta, distends it, and communicates a pulse throughout the arterial system. When

Fig. 2.

the vessel again contracts, regurgitation takes place into the cavity of the heart, as the valves, which should prevent this regurgitation, and maintain the artificial tension, are unable to perform their function. The pulse-beat is accordingly abrupt, and of short duration, and the sphyg-

mographic tracing presents a series of abrupt elevations and depressions. Fig. 3 represents the pulse in a different

Fig. 3.

form of cardiac disease, in which the valves are so affected as to obstruct the passage of the blood into the circulation the effect of this on the pulse is to render its beats weakly marked and irregular, and in the sphygmographic tracing, the elevations are diminished in height and regularity. The pulse, in extreme forms of this lesion, is represented in sphygmographic tracing by a slightly waving line.

SPHYRÆNIDÆ, *sfĭ-rēn'ĭ-dē* [from *sphyræna*, hammer-fish: Gr. *sphyra*, hammer]: family of fishes included by Cuvier in *Percidæ*, but having the ventral fins far behind the pectorals, and the bones of the pelvis quite detached from those of the shoulder. The form is elongated; there are two dorsal fins; scales are small and cycloid; mouth is very large, with strong sharp teeth. The species are found in tropical seas, and sometimes in higher latitudes, as off the New England coast. Some attain large size: e.g., the BARRACOUDA, or Barracouda Pike (*Sphyræna picuda*), inhabitant of tropical parts of the Atlantic; it is scarcely less formidable than the White Shark. It is somewhat esteemed as food, but at some seasons of the year becomes unwholesome. It is a beautiful fish, of rich green color above, and white beneath. The BECUNA (*S. vulgaris*) also is valued as food; and its scales and air-bladder yield a substance used for making artificial pearls. *S. argentea* of the Pacific coast, 3 ft., is also edible.

SPIAL, n. *spī'ăl* [see SPY]: in *OE.*, a spy; a scout.

SPICA, n. *spī'ka* [L., an ear of corn]: in *surg.*, a form of bandage resembling a spike of barley. The turns of the bandage cross like the letter V each leaving a portion uncovered.

SPICATE, a. *spī'kāt* [L. *spīcātus*, furnished with spikes—from *spīca*, an ear of corn, a spike]: in *bot.*, having the form of a spike or ear of corn; arranged in a spike.

SPICCATO, *spĭk-kä'tō* [Ital. separated]: musical term, indicative, like *Staccato* (q.v.), of a distinct and detached mode of performance. Its usual application is to music for bowed instruments, implying that each note is to have a bow distinct from that which precedes or follows it.

SPICE, n. *spīs* [F. *épices;* It. *spezies,* spices: OF. *espice,* spice—from L. *specĭēs,* a kind: in mid. L. *specĭēs,* a spice, drug]: aromatic vegetable substance for seasoning food: a thing that imparts pungency or flavor to food; a small quantity giving a flavor to a greater: V. to season or flavor with spice; to render agreeable to the palate; to tincture. SPI'CING, imp. SPICED, pp. *spīst:* ADJ. seasoned with spice; having an agreeable taste or flavor. SPI'CER, n. *-sėr,* one who deals in spice. SPI'CERY, n. *-ĭ,* fragrant and aromatic substances used in seasoning food. SPICY, a. *spī'sĭ,* fragrant; aromatic; smart; racy; showy; piquant; pungent. SPI'CILY, ad. *-sĭ-lĭ.* SPI'CINESS, n. *-nĕs,* the state or quality of being spicy. SPICE-NUT, small round pieces of ginger-bread spiced. SPICE-WOOD, the wild allspice.—*Spices* are productions almost exclusively of tropical countries. In ancient times and throughout the middle ages, all the spices known in Europe were brought from the east; and Arabia was regarded as the land of spices, but rather because they came through it, or were brought by its merchants, than because they were produced in it, for they were really from the further east. They owe their aroma and pungency chiefly to essential oils which they contain. They are yielded by different parts of plants; some, e.g., pepper, cayenne pepper, pimento, nutmeg, mace, and vanilla, being the fruit or particular part of the fruit; while some, e.g., ginger, are the root-stock; and others, e.g., cinnamon and cassia, are the bark. Tropical America produces some spices, being the native region of cayenne pepper, pimento, and vanilla.

SPICE-BUSH: a tall shrub (*Benzoin benzoin*), of the laurel family. It is conspicuous when leafless on account of its slender branches, and olive-green spotted bark, which has an aromatic odor and taste. Very early in spring the twigs are covered with tufts of honey-scented, tiny flowers, with yellow calyces. They are either polygamous or diœcious, the male flowers having many stamens, and the females a globose ovary and several staminodia. The leaves, which follow, are oval or obovate, and short-pointed. The fruits are oval drupes, bright red in color, and most disagreeable in flavor.

SPICE ISLANDS. See MOLUCCAS.

SPICK AND SPAN, a. *spĭk, spăn* [Eng. *spike,* and Icel. *spann;* Ger. *span,* a chip, a splinter]: bright as a *spike* just made, and a *chip* just split; bright; quite new.

SPICULA, n. *spĭ'kū-lă* [L. *spīcŭlum,* a little sharp point, a dart—dim. of *spīca, spīcum,* a spike, an ear of corn]: in *bot.,* a little spike. SPI'CULAR, a. *-lėr,* resembling a dart or spike; having sharp points. SPI'CULATE, a. *-lāt,* in *bot.,* covered with fine-pointed appendages; having a spike composed of several smaller spikes. SPI'CULE, n. *-kūl,* a minute slender granule or point. SPI'CULUM, n. *-kū-lŭm,* SPI'CULA, n. plu. *-lă,* in *surg.,* a small-pointed piece of bone or other hard matter.

SPIDER, n. *spī'dĕr* [a corruption of *spinder* — from SPIN, so named from *spinning* its web: Dut. *spin;* Ger. *spinne;* Dan. *spinder;* Sw. *spinnel*, a spider]: well-known insect that spins webs to ensnare its prey. SPIDER-LIKE, a. small-bodied and long-legged. SPIDER-WORT, a term applied to the *Tradescantia*, a genus of lily-like plants, ord. *Commelynaceæ.*—*Spider* (*Aranea*), is Linnæan genus, now divided not only into many genera, but also into many families; and constituting a section (*Araneida*) of the class *Arachnida* (q.v.), and order *Pulmonaria*. The species are very numerous, and are found in all parts of the world, but most abundantly in tropical countries, which also produce the largest species, some of them capable of making very small birds, and not merely insects, their prey (see BIRD-CATCHING SPIDER). The *cephalothorax*, formed by the combination of the head and thorax into one piece, is covered with a kind of horny buckler, generally of oval form; the abdomen is attached to it by a short stalk, and is generally soft and tumid. Each of the eight legs consists of seven joints, the last armed with two hooks, usually toothed like a comb. The *frontal claws*, commonly called *mandibles*—which do not, however, correspond to the mandibles of insects, and move in an entirely different direction, up and down—are terminated by a sharp movable hook, which has near its extremity a small slit for emission of a venomous fluid secreted in a gland of the previous joint. The *maxillæ* are two in number, and between them is an organ called the *tongue*, forming part of the external apparatus of the mouth. The maxillæ are the basal joints of the *palpi*, which resemble very small legs, and are often terminated in the females by a small hook, but in the males by complicated and curious appendages, characteristic of the different genera and species. Spiders have generally eight eyes, the relative position of which varies remarkably in the different families and genera. A few species have only six eyes, and a very small number have only two. The upper surface of the abdomen generally shows impressed spots, most conspicuous in those kinds which have smooth naked skin. The pulmonary orifices are either two or four in number, and are near the base of the abdomen. Near the anus are several *spinnerets*, small protuberances, pierced at the extremity with a multitude of minute orifices, from which threads of extreme tenuity are produced, all these threads combining to form one thread of the *web*. The substance which exudes from the spinnerets is glutinous, and immediately dries into thread on coming in contact with the air. It is elaborated in reservoirs, which terminate in intestine-like tubes. All spiders have spinnerets, and produce threads, though all do not use them for the same purposes; for they differ very much in their habits: some employ their webs to catch their insect prey, while others depend for the capture of their prey on their powers of running and leaping; and some weave for themselves habitations, in which they live, while others select holes and crevices as abodes. Almost all spiders envelop their eggs in silken cocoons, which

some of them tear open when the young are hatched; they are attentive to their young, some carrying them for a time on their back, while some carry the cocoons or egg-cases beneath their breast, and others carry them attached to the extremity of the abdomen. Nearly 2,000 eggs have been found in a single cocoon, and the young, when set free, may be seen swarming over the body of the mother, so as almost to conceal her from view. The female S. is, in many of the species, much larger than the male, and a remarkable danger attends the amatory approaches of the latter, as, if they are not favorably received, he is not uncommonly killed and eaten on the spot. Spiders are very pugnacious, and in their combats often sustain the loss of limbs; but, like crustaceans, they possess the power

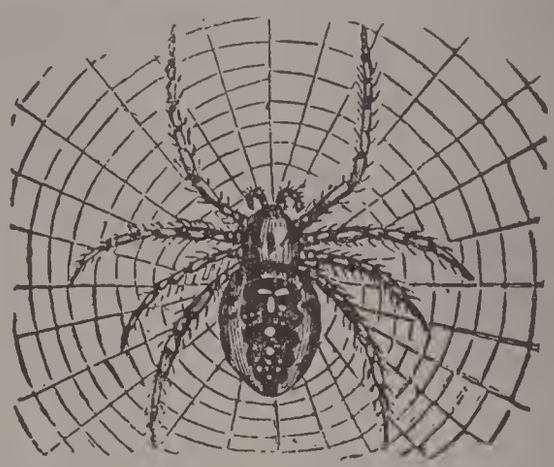
Position of Spider when attached to a thread of web, and spinning apparatus highly magnified.

of repairing their loss. Like them also, they change their skin frequently during their growth; but they undergo no proper transformation. There is much similarity of form among all the multitude of kinds. Many have brilliant and beautiful colors, such as some of the Geometric or Garden S. of the family *Epeiridæ*, which weave geometric webs, and are often marked with bright yellow; one of them is known as the cross or diadem S. from its markings.

All spiders kill the insects and other small creatures on which they prey, by means of their venomous mandibles, and the bite of a house S. is quickly fatal to a house-fly. The bite of the larger species is dreaded even by man, being very painful, and producing inflammation and swelling often with much fever. Death has been known to ensue. But there is a general and groundless fear of S. in temperate climates, though the bite of some species may produce inflammation in some persons who are especially susceptible to any wound or slight poison. Even the dreaded Tarantula is rarely fatal.

Spiders' webs have long been in high repute for stanching wounds. Threads of this material are used also for the cross-wires of astronomical telescopes. Textile fabrics have been made of it, but only as curiosities.

Spiders have been arranged by Walcknaer in five principal groups, distinguished by their habits. (1.) *Hunting Spiders,* which incessantly run about in the vicinity of their abode in quest of prey, some of them weaving silken tubes, in which they dwell, others hiding in fissures; some remarkable for the swiftness in running, others for their power of leaping to seize their prey. Some of them are of large size. Livingstone mentions a s. African one which can leap 12 inches. A small one in temperate climates is often seen, which, when leaping, avoids falling by suspending itself at the same moment by a thread. (2.) *Wandering Spiders,* which have no fixed residence, have the power of running sideways or backward, and throw out threads to entrap prey, but do not weave them into regular webs. Some live among plants, and place their egg-cases on leaves whose edges they bind together with their silk. (3.) *Prowling Spiders,* which have nests, but



Geometric Spider.

prowl about in their neighborhood, or in that of the threads which they spread to catch prey. (4.) *Sedentary Spiders,* such as the common house S., which spin large webs, and lie in wait at the middle or at the side: these are subdivided according to the fashion and structure of their webs. (5.) *Water Spiders,* which resemble the last group in their habits, except that they live in water, generally among the stems and leaves of aquatic plants, where they construct their webs. A very interesting species, one of the most interesting possible inmates of an aquarium, is the Common Water S. (*Argyroneta aquatica*) of Britain, frequent in deep ditches and ponds in parts of England. It is of brownish color, densely covered with hairs, which are of great importance in its economy, entangling air, which the animal carries down with it into the water, to supply its pulmonary sacs; for the water spiders all breathe by the same kind of organs as their terrestrial congeners. The eggs of the water S. are attached to the leaves or stems of plants under the surface of the water, and are protected by a dome-shaped web, so close in its structure as to retain the air which is brought into it, and in which the S. itself lives, bringing down air on its furred body till the dome is filled. The entrance is from

below. Other water S. are minute and of brilliant scarlet or crimson, like similar land species. The most curious nests are those of the Trap-door Spiders, belonging to the group *Territelariæ*, or underground weavers. The nest is a tubular burrow, lined with silk, and having the entrance covered with a circular lid of the same material attached to the edge of the lining by a kind of hinge. In the most common form of nest, the lid is made thick by having layers of earth between the layers of silk, and fits like a cork into the mouth of the tube, which is bevelled to receive it. As mosses grow on the lid as well as on the surrounding ground, the concealment is complete. In some types of nest, there is a thin external door, then one more solid a few inches below, behind which the inmate can place itself, and resist the intrusion of an enemy

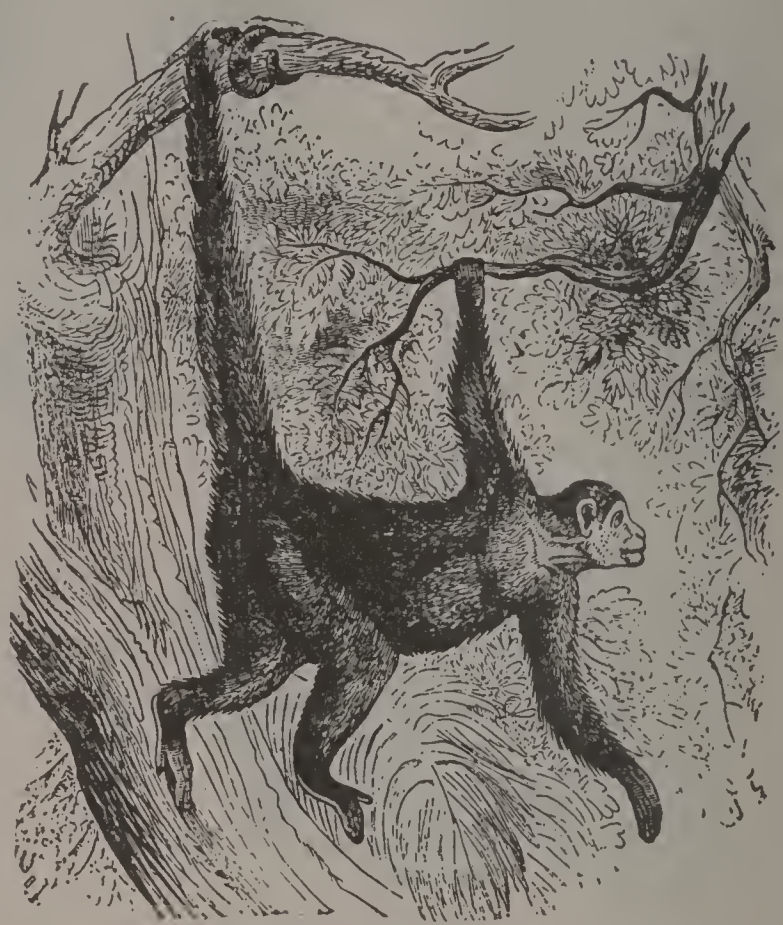
Trap-door, open.

In one kind of these double-door nests, a side-gallery branches off from the main one, and the external door is so placed at the angle that it can be made to shut either.

SPIDER FLY: general name for parasitic dipterous insects of the three different families, *Bracelidæ*, *Hippoboscidæ*, and *Nycteribiidæ*. According to the animal which they infest, they take the names Bat-louse, Bird-louse, Bee-louse, Sheep-tick, etc. They owe their name S. F. to a superficial resemblance to spiders. They are closely allied to the Forest Fly (q.v.): but the claws of the tarsi have three instead of two teeth. *O. avicularia* frequently infests the common fowl, and other birds: it is greenish-yellow, with smoke-colored wings.

SPIDER MONKEY: name often given to species of the genera *Ateles* and *Brachyteles*, small American monkeys, on account of their very long, slender, inelegant limbs. The tail is very long, and not only prehensile in the highest degree, but endowed with a wondrous sensitiveness of touch. These monkeys show much intelligence. It is their common practice to break nuts by means of stones; a tame one has been known to try a larger stone if the first did not serve its purpose, and even to take it up in both paws, and dash it upon the nut, jumping quickly aside to avoid injury to its toes. This animal generally rode on the back of a large mastiff, and in descending a steep hill,

would curl its tail round the root of the mastiff's tail, to make its seat secure.



Spider Monkey.

SPIEGEL-EISEN, n. *spē'gĕl-īs'ĕn* [Ger. *spiegel*, a mirror; *eisen*, iron]: peculiar kind of cast-iron, so called from its shining or specular crystalline fracture: see BESSEMER STEEL: KRUPP'S STEEL.

SPIGELIA, *spī-jē'lĭ-a:* genus of plants of nat. order *Loganiaceæ*, having a calyx glandular inside, a long slender valvate corolla, long filaments, and a capsule of two *cocci*, splitting around at the base: they are named in honor of Adrian Vander Spiegel.—*S. Marilandica*, often called WORM GRASS and CAROLINA PINK, is native of the s. United States, a perennial plant with simple quadrangular stem. It is 6–18 in. high, its spiked flowers 1½ in. long, slender, red outside and yellow within. The root (PINK ROOT) is purgative, narcotic, and poisonous, but is a powerful vermifuge much employed in the U. S.—*S. Anthelmia*, annual, native of tropical America, with very small purplish flowers, in spike-like racemes, possesses similar properties. The efficacy of both is, however, impaired by keeping; and they are apt to produce unpleasant symptoms when used as medicines. Other species are known as poisons.

SPIGNEL, n. *spĭg'nĕl* [said to be a corruption of *spike-nail*]: a wild umbelliferous plant; *Meum athaman'tĭcum;* also SPICKNEL.

SPIGOT, n. *spĭg'ŏt* [L. *spīca*, a spike: W. *ysbigod*, a spigot; *ysbig*, a spine: Gael. *spiocaid*, a spigot]: a peg to stop the vent-hole of a cask or the pipe of a faucet; the *faucet* is the pipe in the cask for drawing off liquor.

SPIKE, n. *spīk* [Sw. *spik*, a nail: Low Ger. *speke;* Ger. *speiche*, the spoke of a wheel: L. *spica*, an ear of corn, a point]: a large nail; a pointed bar of iron, sometimes of wood; the iron rod driven into the vent of a gun.—In *bot.*, an inflorescence consisting of numerous flowers, sessile (i.e., with very short stalks), on an axis or single stem, as in the wheat and lavender; an ear of corn. In rye, wheat, barley, darnel, and many other grasses, there is a sort of compound spike; i.e., the flowers or fruits are arranged together in spikelets, upon short stalks, which again surround the top of the culm in the form of a spike. The catkin, the spadix, and the cone may be regarded as varieties of the spike. SPIKE, v. to fasten with spikes or large nails; to set with spikes; to drive into the touch-hole of a cannon a spike or long nail (see SPIKING OF CANNON). SPI'KING, imp. SPIKED, pp. *spīkt:* ADJ. having spikes; having ears or those parts containing seed; formed as a spike; terminating in a sharp point. SPIKY, a. *spī'kĭ*, sharp-pointed. SPIKELET, n. *spīk'lĕt*, a small spike; in *bot.*, the small cluster of flowers within the glumes in grasses.

a, Spike of *Plantago major; b*, section of it to show the sessile flowers; *c*, spike of *Lolium perenne; d*, spikelet of same.

SPIKENARD, n. *spīk'nârd* [L. *spīca-nardī*, a spike or ear of nard: Ger. *spieke*, spikenard: Eng. *spike*, and *nard*]: the *spike* or ear of the *nardus*, which is highly aromatic; the plant itself, or an oil extracted from it. Spikenard was highly prized as a perfume by the ancients, and used both in baths and at feasts. It was brought from India, and was very costly. The 'ointment of spikenard' (John xii. 3) was probably an oil or fat, impregnated with the perfume. The plant which produces it has been ascertained by the researches of Sir William Jones and Dr. Royle to be the *Nardostachys jatamansi*, the Jatamansi of the Hindus, a small plant of nat. order *Valerianaceæ*, native of the mountains of n. India, and found at least as far s. as the Deccan. It grows on the Himalaya as far as the altitude of 18,000 feet, and its roots are a favorite perfume in Tibet and Nepaul. The ladies of Nepaul use oil in which the root has been steeped for perfuming their hair. The odor is not, however, generally agreeable to Europeans: it is intermediate between Valerian (q.v.) and Patchoule (q.v.). The root, 3 to 12 inches long, sends up many stems, with ltttle spikes of purple flowers, which have four stamens.—The name Spikenard (*ñardos*) was given by the ancients to perfumes used as substitutes for

the true or Indian spikenard; some of which were derived from the roots of plants of the same nat. order, the kind called Gallic or Celtic spikenard from those of *Valeriana Celtica* and *V. salicina*, which are still used in the East for perfuming baths; and that called Cretan spikenard from roots of *V. Italica*, *V. tuberosa*, and *V. phu*. All these grow on the Alps and other mountains of s. Europe, and the peasantry of Styria and Carinthia collect them from rocks on the borders of perpetual snow. They are tied in bundles, and sold at a very low price to merchants, who sell them at a great profit in Turkey and Egypt, from which they are partly transmitted even to India. About 50 tons are annually exported from Trieste.

American S. is a herbaceous plant having a short thick rootstock which is used medicinally instead of sarsaparilla its botanic name is *Aralia racemosa*, and it is a congener of wild sarsaparilla, the angelica tree, and small Spikenard (*Aralia nudicaulis*)

SPIKING OF CANNON: operation of rendering a cannon useless without expenditure of much time and labor. It is resorted to by troops compelled to abandon their own ordnance, or unable to remove pieces of the enemy's which they have captured. The process consists in driving a nail or spike into the vent or touchhole, and then breaking it off short with a hammer. Spikes for this purpose may have a spring on the side at the end, which can be compressed in driving through the vent, and will open again when the end has passed through. Sometimes, if the gun be of brass, a few drops of sulphuric or nitric acid on the touchhole will render it practicable to extract the spike. Often the resort must be to the tedious process of drilling out the spike or boring a new vent.

SPILE, n. *spīl*, or SPILL, n. *spĭl* [Ger. *spille*, a pin: It. *spillo*, a pin, a small hole]: the vent-peg of a cask: V. to bore a hole for a peg and to let in the air, as in a cask. SPILING, imp. SPILED, pp. *spīld*. SPILE-HOLE, a small hole in a cask for air, that can be plugged with a peg.

SPILL, v. *spĭl* [Low Ger. *spillen*, to shed, to waste: Ger. *spülen;* Sw. *spola*, to wash or rinse]: to suffer a liquid or any powder to run over, or to fall out of a vessel; to shed, used especially of blood: to be lost or wasted; in *OE.*, to waste: to injure. SPILL'ING, imp. SPILLED, pp. *spĭld*, or SPILT, pp. *spĭlt*: ADJ. poured out or wasted. SPIL'LER n. *-lĕr*, one who spills: a kind of fishing-line. SPILLING LINES in a *ship*, certain ropes used to dislodge the wind from a sail in order to furl it the more easily. *Note.*—To *spill* expresses an accidental loss, as distinguished from to *pour*, which implies voluntary action.

SPILL n. *spĭl* [Dut. *speld*, *spil*, a pin]: a thin slip or splinter of wood: a chip, a small bar or pin of iron pointed: a small roll of paper, or thin slip of wood, for lighting a lamp.

SPILT, v. *spĭlt:* see under SPILL 1.

SPILTH, n. *spĭlth* [see SPILL 1], in *OE.*, anything wasted.

SPIN, v. *spĭn* [Icel. *spinna;* Dan. *spinde;* Dut. and Ger. *spinnen,* to spin: comp. Gael. *spion,* to draw out]: to draw out and twist into threads or yarn (see SPINNING): to extend to a great length; to draw out to a tedious length; to whirl or turn rapidly as by means of thread —applied to the motion of any body on its axis, as a top; to exercise the art or trade of drawing out into threads; to issue in a very small current. SPIN'NING, imp.: N. the art or practice of drawing out into threads, as wool, cotton, flax, etc. SPAN, pt. *spăn,* or SPUN, *spŭn,* did spin. SPUN, pp. *spŭn.* SPINNER, n. *spĭn'nėr,* one who spins; a spider. SPIN'NERET, n. *-ĕt,* in *insects,* an organ with which they form their silk or webs. SPIN'STER, n. *-stėr,* one who spins; hence in *law,* the term applied to a maiden or unmarried female. SPINNING-JENNY, machine for spinning wool or cotton, consisting essentially of a large number of spindles made to revolve simultaneously (see SPINNING). SPINNING-WHEEL, machine for spinning yarn or thread, driven by the hand, or by the foot acting on a treadle. TO SPIN A YARN, among *sailors,* to tell a tale. TO SPIN OUT THE TIME, to take means to occupy as much of it as possible to serve a purpose; to protract.

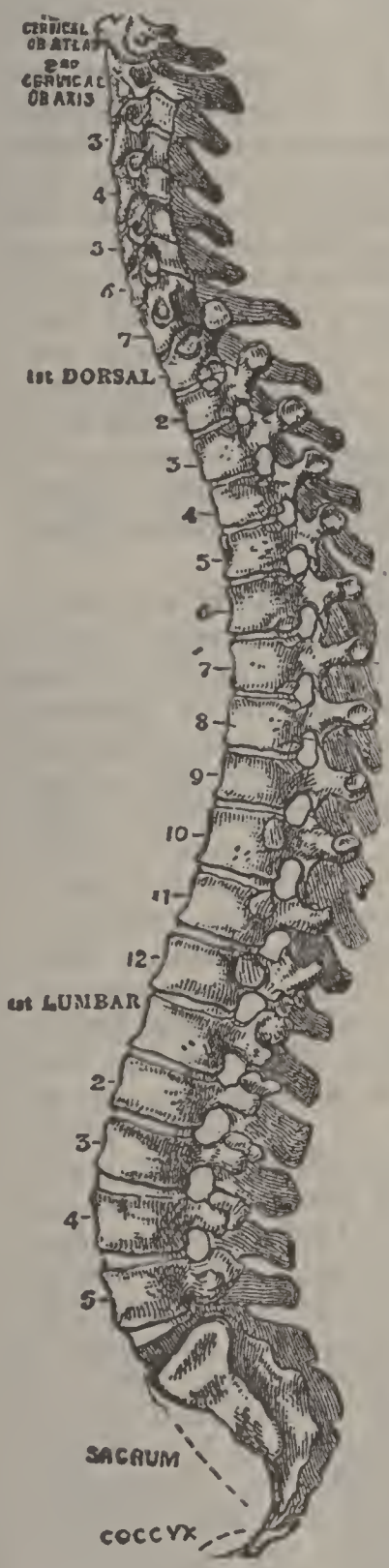
SPINA BIFIDA, *spī'nâ bĭf'ĭ-dâ* [L. *cleft spine*]: congenital malformation, arising from arrest of development; it is congenital hernia of the membranes of the spinal cord, through a fissure in the wall of the bony canal. A tumor is thus formed, usually of roundish shape, varying in size from that of an egg to that of an adult head, in the lumbar or sacral region of the vertebral column, and adhering to the adjacent vertebræ either directly or by a pedicle. It is often accompanied with paralysis of the lower extremities. As the size of the tumor increases, fatal convulsions ensue; or the skin investing the tumor may ulcerate, and the contents escape, in which case palsy or convulsions produce death; yet patients with this affection have survived till middle life. Active surgical treatment usually hastens death, and should be resorted to only in most urgent circumstances. Moderate support by means of a hollow truss, or a well-padded concave shield, may tend to keep the disease stationary.

SPINACH, n., or SPINAGE, n. *spĭn'āj* [It. *spinace;* Sp. *espinaca,* spinach—from L. *spīna,* a spine; so named from its prickly fruit]: a garden plant whose leaves are used as a table vegetable. SPINACEOUS, a. *spĭ-nā'shŭs,* pertaining to spinach.—*Spinach* (*Spinacia*) is a genus of herbaceous plants, of nat. order *Chenopodiaceæ;* diœcious, the male flowers consisting of a 4-parted perianth and four stamens; the female of a 2-3 cleft perianth and a germen with four styles; the perianth hardening around the fruit as it ripens; the fruit an achenium. COMMON SPINACH, or GARDEN SPINACH (*S. oleracea*), is in general cultivation for its young leaves, which are a favorite and wholesome vegetable, prepared either by boiling, or by

frying with a little butter. Spinach is an annual. Its stem rises 2 to 4 ft.; the male flowers are in long spikes, the female in clusters close to the stem. There are about 20 varieties. The soil should be very rich and thoroughly pulverized. Sowing is to be in drills 12 to 15 in. apart, and, if a succession is desired, should be done at intervals of three weeks; though for the fall crop August and for spring use September or October is the usual time. From 10 to 15 lbs. of seed per acre will be required, and if the ground is dry it must be pressed very firmly upon the seed. Frequent cultivation is needed, and if the plants are crowded they should be thinned. Spinach is grown sometimes between the rows of crops which require a longer time for development, the spinach being ready for use in 4 to 6 weeks after seed is sown. At the north, spinach should be lightly covered with straw or leaves if left in the ground over winter. This crop is grown extensively in the neighborhood of large cities, in open ground, also under glass, and considerable quantities are grown for markets. The price fluctuates greatly, from 50 cents to several dollars per barrel.—Spinach is probably a native of w. Asia. The name is given also to a number of other plants of very different botanical characters, but which have the same qualities, and are used as substitutes. Of these one of the most important is NEW ZEALAND SPINACH (*Tetragonia expansa*), which has thick leaves and endures the heat of summer better than the common spinach.—Other substitutes are Orache (*Atriplex Hortensis*), Kale, and Strawberry Blite (*Blitum Capitalum*)—the latter being valuable mainly for its hardiness and its ornamental appearance.

SPI'NAL COLUMN, or SPINE, THE: most important and characteristic part of the skeleton of the highest animal sub-kingdom, which includes Mammals, Birds, Reptiles, Amphibians, and Fishes: see SPINE: SKELETON. The vertebræ vary greatly in number in different animals, and even in members of the same class, and the number has no apparent relation to the other organs of the animal. Moreover, in shape they differ extremely even in different parts of the same spine, in accordance with their special functions. In man, the number of vertebræ which collectively form the spinal column is 7 in the neck (cervical vertebræ), 12 in the back (dorsal vertebræ), 5 in the loins (lumbar vertebræ)—all capable of being detached from one another, and termed *true* vertebræ; and 5 vertebræ ossified together and forming the sacrum, and 4 or 5 similarly united, forming the termination of the column, and constituting the bone called the coccyx—known as *false* vertebræ. However long or short the neck may be, every mammal has 7 cervical vertebræ, excepting the three-toed sloth, which has 9, and the sea-cow, which has 6. In other regions of the spine, no such law exists. Each vertebra is attached to the two between which it lies by numerous strong and more or less elastic liga-

ments, and between each pair of vertebræ there is interposed a lenticular disk of fibro-cartilage which acts as a buffer. Thus the spinal column is rendered highly elastic, the communication of jars or shocks is prevented, and a considerable general range of movement permitted, though the motion between any two adjacent vertebræ is slight. The elasticity of the column is further increased by the component vertebræ being arranged in curves instead of perpendicularly. The curves should be exactly in the antero-posterior direction, any well-marked lateral deviation from the perpendicular being abnormal (see SPINE, CURVATURE OF THE); but a very slight lateral curvature with the convexity to the right may often be detected in upper and middle parts of the back, and is supposed to be dependent on the more frequent use and greater strength of the right arm as compared with the left. These curves are termed from their position the cervical, dorsal, lumbar, and pelvic curves. The dorsal and pelvic curves have their concavities in front, and thus enlarge the spaces in which the thoracic and pelvic viscera are contained; the two other curves are convex anteriorly, and thus afford support to parts about them. The upper three curves are so arranged that their cords are in the same vertical line in the erect position of the body, and this vertical line corresponds with the line of gravity of the head. The cause of these curves is to be sought partly in the shape of the vertebral bodies, partly in that of the invertebral substance. Among the uses of these curves are: (1) they enable the spine to bear greater vertical weight than it could otherwise maintain; it is calculated that nine times as great a vertical force is required to bend it as if it had been straight; (2) they facilitate the movements of the body, especially in the act of running; (3) they are so disposed as to protect the cord in move-



Spinal Column.

ments of the spine. Similar curves are seen in the spine of other mammals, though the degree of flexure is liable to great deviations: the lumbar curve, which has especial reference to the erect position, is always much less marked than in man.

The vetebral canal formed by the apposition of the spinal foramina, or neural arches (see SKELETON), and containing and protecting the spinal cord, varies in its size at different parts of the column. It is largest in its antero-posterior diameter in the neck and loins (measuring at the last lumbar vertebra $\frac{7}{8}$ of an inch), where the antero-posterior movements of the spine are greatest, and where the cord is least closely attached to the vertebræ; while in its lateral diameter it is greatest at the atlas, where it measures nearly an inch and a half. A transverse section of the canal is nearly circular through the greater part of the back. The intervertebral foramina through which the nerves emerge vary in shape and position in different parts, but are always of sufficient size to prevent injurious pressure on the nerves during movement of the spine; and in the dorsal region, which is the ordinary seat of angular curvature, the nerves are so protected by bony arches that they may escape injury even when the bodies of several dorsal vertebræ have been destroyed by ulceration.

SPINAL CORD (or SPINAL MARROW), THE: that elongated part of the cerebro-spinal axis (see NERVOUS SYSTEM) contained in the spinal canal, from the brain superiorly to the first or second lumbar vertebra inferiorly (in man), where it merges into the *Filum terminale*, which extends to the lower end of the sacral canal, and in no way differs structurally from the proper spinal cord, except that no nerve-roots are connected with it. Its length varies from 15 to 18 in., and it presents a difference in its diameter in different parts, there being an upper or cervical, and a lower or lumbar enlargement. In form it is a flattened cylinder. It is almost completely divided, along the median plane, by an anterior and posterior fissure, into two equal and symmetrical parts. The anterior fissure is more distinct and wider at the surface than the posterior fissure, but it penetrates to only about one-third of the thickness of the cord, while the posterior fissure

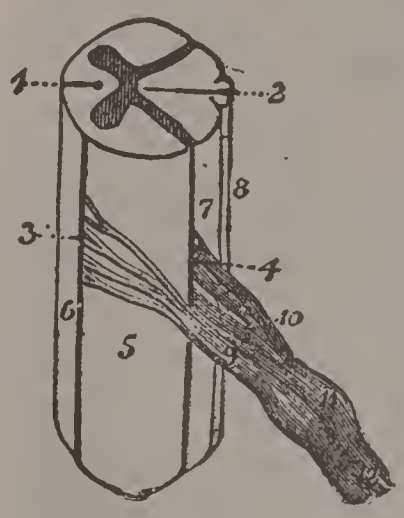


Fig. 1.—Side-view of the Spinal Cord, showing the Fissures and Columns.
1, anterior median fissure; 2, posterior median fissure; 3, anterior lateral fissure; 4, posterior lateral fissure; 5, lateral column; 6, anterior column; 7, posterior column; 8, posterior median column; 9, anterior root; 10, posterior root; and 11, ganglion of (12) a spinal nerve.—From Gray's Human Anatomy.

extends to about half the thickness of the cord. The two halves are hence united only near the centre by a commissural band, which is traversed by the 'spinal canal' (fig. 2, *f*), extending downward from the fourth ventricle (see BRAIN), and about one-hundredth of an inch in diameter. A posterior and an anterior lateral furrow (two shallow depressions, the latter scarcely perceptible) further divide each half of the cord into a posterior, a lateral, and an anterior column; these two furrows corresponding with the lines of attachment of the posterior and anterior nerve-roots. The separation of the antero-lateral columns into the 'anterior' and the lateral columns (A, A, and L, L, in fig. 2) is made more obvious internally by the mode in which the gray nervous matter (see NERVOUS SYSTEM) is arranged

Fig. 2.—Magnified View of Transverse Section of the Spinal Cord through the Middle of the Lumbar Enlargement; showing, on the right side, the course of the Nerve-roots, and on the left, the position of the principal tracts of Vesicular Matter.

A, A, anterior columns; P, P, posterior columns; L, L, lateral columns; *a*, anterior median fissure; *p*, posterior median fissure; *b*, *b*, *b*, *b*, anterior roots of spinal nerves; *c*, *c*, *c*, *c*, posterior roots; *d*, *d*, tracts of gray matter in anterior column; *e*, tracts of gray matter in posterior column; *f*, spinal canal.—After J. L. Clarke.

in relation to the white matter. Although the distribution of the gray matter differs considerably in different parts of the spinal cord, it usually presents in a transverse section the form of two somewhat crescent-shaped masses, whose convexities are turned toward each other and connected by the gray commissure, while their cornua are directed toward the surface of the cord: the posterior peak on each side nearly reaches the posterior lateral furrow; while the anterior, though the larger cornu, does not approach quite so near the surface at the as-

sumed anterior furrow. The enlargement of the spinal cord in the cervical and lumbar region, where the great nervous plexuses are given off, is due chiefly to the increase, at those points, of gray matter, which is comparatively deficient in the interval between them. The white substance seems to increase regularly from the lower to the upper part of the spinal cord; and this fact indicates that the longitudinal columns serve to establish a direct connection between the encephalic centres and the roots of the spinal nerves. Careful microscopic investigation has revealed the fact that the root-fibres of the spinal nerves run two very distinct courses in the substance of the cord; the first *transverse*, and the second *longitudinal* The transverse fibres traverse the cord horizontally or obliquely, and appear to pass out in the other set of roots connected with the same segment, either on its own or on the opposite side of the median fissure; while the longitudinal fibres in part connect the posterior roots directly with the posterior column without passing into the gray matter, but for the most part enter the gray matter, and emerge from it into the posterior column, or into the posterior part of the lateral column of the same or the opposite side.

In considering the functions of the spinal cord, we have to regard it in two distinct points of view—first, as a *conductor* of nervous force between the nerve-trunks and the brain; secondly, as an *independent nervous centre*. As a mere *conductor* of nervous force, its functions and behavior are the same as those of a nerve-trunk; for, if it be divided, all the parts of the body which are supplied by nerves coming off below the point of section are completely paralyzed, as far as regards sensibility and voluntary movement; no impressions made upon them having the least power to affect the consciousness, and no exertion of the will being able to determine contraction of the muscles. This state of *paraplegia*, which may be experimentally induced in animals, is frequently exhibited in man, as a result of injury or of disease that seriously implicates the spinal cord.

We have now to consider the spinal cord as an *independent nervous centre*. The simplest and at the same time most decisive evidence of the independent power of the spinal cord is derived from the motion exhibited by the limbs of animals when irritation is applied to them after section of the cord at some point above the entrance of their nerves; the fact that these movements are reflected through the cord, and do not result from direct stimulation of the part irritated, being shown by their complete cessation when the nerve-trunks are divided. Thus, if a frog be pithed by dividing the cord between the occipital foramen and the first vertebra, a convulsion takes place while the knife passes through the nervous centre; but this quickly subsides, and if the animal be placed on the table, it will resume its ordi-

nary position. It is quite unable to move by any voluntary effort; but if a toe be pinched, the limb is instantly drawn up, and seen to push away the irritating agent and then draw itself up again to the old position.

From these and other experiments, we may conclude (1) that the spinal cord, *in union with the brain,* is the instrument of sensation and voluntary motion to the trunk and extremities; (2) that the spinal cord may be the medium for the excitation of movement, *independently* of volition or sensation, either by direct irritation of its substance, or by the influence of a stimulus conveyed to it from some surface of the trunk or extremities by its nerves distributed on that surface.

SPINAL, SPINESCENT. See under SPINE.

SPINDLE, n. *spĭn'dl* [Ger. *spindel,* a spindle: AS. *spinl,* a spindle—from *spinnan,* to spin (see SPIN)]: the pin or thin rod, formerly used in spinning, for twisting the fibres drawn from the distaff; any axis of revolution, as the axis of a wheel, of a capstan, etc.; a yarn-measure: V. among *gardeners,* to put forth a long and slender stalk. SPIN'DLING, imp. SNIN'DLED, pp. *-dld.* SPINDLE-LEGGED or -SHANKED, having long, slender legs. SPINDLE-VALVE, a lift valve guided by an axial spindle or central stem.

SPINDLE TREE (*Euonymus*): genus of plants of nat. order *Celastraceæ.* This order contains about 260 known species, all small trees or shrubs.—The genus *Euonymus* has a lobed capsule, and seeds surrounded by an aril, which in some of the species, is remarkable for brilliancy of color. The Common Spindle Tree (*E. Europæa*), native of Britain and of great part of Europe, is ornamental when in fruit, and its aril is of fine orange color: it is a shrub rather than a tree, and is inferior to the American species. The wood is hard and fine grained, and is used for finer articles of turnery and for skewers: formerly it was used for making musical instruments and for spindles, whence the name of the shrub. In Germany, the shoots are bored for tubes of tobacco-pipes. Charcoal made of its small shoots is valued for crayons.—*E. atropurpurea,* a species native to the United States, also is popularly called *Spindle Tree,* but more commonly known as the Wahoo and the burning-bush. *E. Americanus,* the Amer. Strawberry-bush, a lower shrub, has 3-lobed fruit, instead of 4-lobed, like the preceding. *E. Japonicus* is a greenhouse plant at the north.

SPINE, n. *spīn* [L. *spīna,* a thorn, the spine: It. *spina;* F. *épine,* the spine]: a spike or thorn; a thin sharp-pointed thing; the vertebral column or backbone (see SPINAL COLUMN): in *bot.,* an abortive branch with a hard sharp point. SPINY, a. *spī'nĭ,* full of spines; thorny; difficult; slender. SPI'NINESS, n. *-nĕs,* the state or quality of having spines. SPI'NAL, a. *-năl* [F. *spinal*—from L.

spīnālis, spinal]: of or relating to the backbone. SPINAL COLUMN, the connected vertebræ of the back, or its cartilaginous substitute, forming the sheath for the spinal cord; the backbone (see above). SPINESCENT, a. *spī-nĕs'-sĕnt,* in *bot.,* terminating in a spine; tapering to a rigid leafless point; tipped with a spine. SPINIFORM, a. *spī'-nĭ-fawrm* [L. *forma,* shape]: like a spine or thorn. SPI'NOSE, a. *-nōs,* or SPI'NOUS, a. *-nŭs,* full of spines; thorny. SPI'NULE, n. *-nūl,* a minute spine. SPI'NULOSE, a. *-nū-lōs,* or SPI'NULOUS, a. *-lŭs,* covered with or bearing minute spines. SPINAL CORD, or SPINAL MARROW, grayish-white nervous matter lodged in the interior of the spinal column or backbones, the axial nervous system of the body —a continuation of the brain.

SPINE, CURVATURE OF THE: malady known in two perfectly distinct forms: LATERAL CURVATURE—arising from weakness of the bones, ligaments, and muscles, and fearfully common in girls between the ages of 10 and 16, whose muscular system is weak and who are growing rapidly; and ANGULAR CURVATURE (frequently known as POTT'S CURVATURE, or POTT'S DISEASE, from that eminent surgeon having been the first to describe its true nature), which consists of caries of the bodies of the vertebræ, and is by far the more serious affection of the two.

Lateral Curvature denotes deformity of the bones of the spine and chest, with corresponding change of the structures in relation to them. It is called 'lateral' from the spine being curved sideways; and to distinguish it from 'angular' deformity, in which the spine is directed from behind forward, owing to excavations in its forepart from caries. The first symptom usually to attract attention is a projection of one scapula, or an elevation of one shoulder, generally the right; the right shoulder and the right side of the chest being unnaturally high and rounded, while on the left side the shoulder is depressed, and the side of the chest concave. On examination, the spine is found to have acquired a spiral appearance. This condition gives rise to various changes, including a *humped* appearance, great displacement of the ribs, diminution of the cavity of the chest, and proportionate wasting of the lung. In consequence of these physical changes, the patient can no longer walk in a simple and natural manner, but with halting, jerking, awkward gait.

The following are among principal causes of lateral curvature: 1. The suppleness of the spine in the young, its structures being then more gristle than bone, and the column virtually immature. 2. Weakness of the muscles, which often are not properly exercised in girls of the age at which this disorder occurs. This muscular debility is usually followed by deterioration of the bones and their ligaments; and this, apart from other obvious and direct bad effects, tends to make all the component parts of the

spine—vertebræ and articulations—more prone to yield to the superincumbent weight, and to become distorted. These evil results are increased by prolonged stooping, or by a habit of standing and throwing the weight of the body constantly on one leg. Such attitudes may be observed in a school-room. Many of the pupils will be seen instinctively relieving the pain of over-fatigue by throwing the weight on the insensible fibrous structures, thus relieving the aching muscles. When such attitudes are long indulged in, the ligaments undergo a process of over-stretching, and a general looseness of the vertebral joints is the result. By standing on one leg, or, more correctly speaking, by throwing all the weight of the body on one foot, the body is kept upright with the least possible expenditure of muscular power: hence a weak and fragile girl is induced to adopt this position. Too long indulgence in this habit will aggravate existing curvature, or induce it if it does not already exist. Another usually unrecognized cause of lateral curvature in the young is astigmatism (see SIGHT, DEFECTS OF). In certain cases of this defect, when the inequality of curvature of the cornea or crystalline lens is in a certain direction, the child is obliged to hold the head to one side in order to see to read. This causes a lateral curvature of the neck, and in order to maintain the erect posture there must be a compensatory curve in the dorsal spine in the other direction. At first this secondary curve is straightened out as soon as the child ceases to use the eyes, as during sleep, but in the course of time it becomes permanent unless the defect of vision is corrected by appropriate glasses. Every child who is observed to carry the head habitually inclined in one or the other direction laterally should be examined for astigmatism by an oculist, and, if this defect is found to be present, should be fitted with glasses to correct it.

However slight a curve in the spine of a young person may be, it ought to be deemed important; for when the column inclines laterally even to a slight degree, the superincumbent weight ceases to be supported on the line of the vertical axis, and falls on the oblique processes of the side to which the person leans; and these processes becoming rapidly diminished in length by absorption, induced by this abnormal pressure, general distortion soon begins. Distortion beginning at the age of 10 is more dangerous than at 14, because the disease runs a more rapid course in the younger cases. A cure is, for the same reason, more easily effected in the younger patient. If the patient's age be beyond 16, little can be done beyond checking the further progress of the deformity.

When a girl is defective in muscular power, disinclined to take exercise, and prone to distortion of the spine, the sitting position does not afford her rest, in consequence of the great efforts requisite to keep the body erect. A patient in that condition will be benefited by regularly lying two or three hours daily, at divided intervals, on a

sofa or board. But the eyes should also be examined by an oculist, for, as stated above, the curvature may be initiated or at least aggravated, by the inclination of the head necessary to secure fair sight if oblique astigmatism is present. When the deformity has actually occurred, gymnastic exercises suggested by the medical attendant will frequently, when continued for some time, have the effect of loosening the connection of the bones, of facilitating their falling into their proper places, when extension is employed, and of restoring to the spine a portion of its lost suppleness. Or, let the patient lie on one side, with a firm cylindrical pillow, 6 in. in diameter, placed under the gibbosity of that side, and let her rest her weight on the pillow; the effect will be to counteract and reverse the curve. The posture may be continued each way for a quarter of an hour at a time, and be repeated twice or thrice daily. There are two methods of extending the curved spine—(1) by stretching the body while the patient is recumbent; (2) by letting the patient remain upright, and using spinal supports. As each method has its own advantages, a combination of them will often afford the best results. The chief objections to the former are the necessary confinement, comparative seclusion, and interference with the routine of study. Any mode of treatment with the view of producing extension of the spine must be continued for months, to be of any avail. As to the various extending beds, apparatuses for exercise, and different kinds of spinal supports, devised by surgeons and anatomical mechanicians—it is to be observed merely that mechanical supports must be tried with great caution. They are always more or less irksome to bear, and if they are not doing good, are almost sure to be doing harm.

For *Angular Curvature,* see POTT'S DISEASE.

SPINE, or THORN, in Botany: sharp-pointed projection of the wood of a stem or branch; differing essentially from a Prickle (q.v.) in being connected with the wood and covered with bark. A spine is, in fact, a branch arrested in its growth and modified. In some trees and shrubs, e.g., the sloe, branches which bear leaves often terminate in a spine. Cultivation, or whatever tends to increase luxuriance of a plant, diminishes the tendency to produce spines. The name spine is given also to the sharp extremities of the midrib of leaves, and to the sharp angular projections of the margin of hard leaves, as in the holly. In some plants, the stipules are metamorphosed into spines.

SPINEL, n. *spĭn'ĕl* [F. *spinelle;* It. *spinella,* the spinel ruby]: an isometric mineral of many colors, almost always in octahedral or dodecahedral crystals. Octahedral twins are so common as to give the name 'spinel twin' to this form. It is characterized by a hardness of 8, which is exceeded by only three minerals, diamond, corundum, and chrysoberyl, and is equaled by but a few. It is

brittle; fracture conchoidal; specific gravity, 3.5 to 4.1; lustre vitreous; streak white; transparent to nearly opaque. Essentially it is a magnesium aluminate, or a compound of the oxides of magnesium and aluminum, these metals being at times in part replaced by iron, and, in the variety picotite, also by chromium. The varieties are distinguished by differences both in color and composition. The red variety is often transparent, and is known as ruby spinel (q.v.) or balas ruby. Rubicelle is yellow or orange-red; ceylonite or pleonaste is dark-green, brown, or black, and nearly opaque; chlorospinel is grass-green. Blue and yellow varieties are also found and sometimes yield choice gems. Its most noteworthy occurrences are in the gem gravels of Ceylon, Burma, and Siam, in the ejected blocks of Vesuvius and in the limestone belt of Orange co., New York, and Sussex co., New Jersey.

SPINEL GROUP: an important group of isometric minerals, usually included among the oxides, though chemically they are oxygen salts. The group embraces the closely related aluminates, spinel, hercynite, and gahnite; the ferrates and manganates, magnetite, magnesioferrite, franklinite, and jacobsite; and the metachromite, chromite. Their general formula is $R''R''{}'_2O_4$.

SPINELLO, *spē-nĕl'lō*, DI LUCA (called SPINELLO, ARETINO): Italian painter: b. Arezzo 1333; d. there 1410. His principal frescoes were done for the sacristy of the church of Saint Miniatus near Florence, for buildings at Pisa, Siena, Arezzo, and for the municipal buildings of Siena (a series illustrating the Italian wars of Frederick Barbarossa). Spinello enjoyed a great reputation in his own day. His *Virgin and Child* sold in 1889 for $3,725.

SPINET, n. *spĭn'ĕt* [OF. *espinette;* It. *spinetta,* a spinet—from L. *spīna,* a spine, so called because struck with a pointed quill]: musical instrument resembling the harpsichord, not now in use. The spinet was smaller and weaker than the harpsichord, and, like it, was one of the precursors of the Pianoforte (q.v.). Each note had but one string, which was struck by a quilled jack acted on by one of the finger-keys. The strings were placed horizontally and nearly at right angles to the keys, as in the square pianoforte; and the general outline of the instrument nearly resembled that of a harp laid in horizontal position, with the keys occupying the position of the sounding-board; on which account the spinet, when introduced, was called the couched harp.

SPINIFEROUS, a. *spī-nĭf'ĕr-ŭs* [L. *spīnĭfer,* thorn-bearing, prickly—from *spīna,* a thorn; *fero,* I bear]: in *bot.,* producing or bearing spines or thorns; thorny. SPINIF'ERITES, n. plu. *-īts,* in *geol.,* a term applied to those minute spherical bodies beset with spines which occur in the chalk and flint.

SPINIFORM, SPINOSE, SPINOUS, etc. See under SPINE.

SPIN'NER, Francis Elias, financier: 1802, Jan. 21—1890, Dec. 31: b. German Flats (Mohawk), N. Y. He learned the trade of harness-maker; at the age of 22 engaged in business at Herkimer, N. Y.; became a deputy-sheriff 1829, maj.gen. of a division of the state artillery 1834; and from 1839 was connected with the Mohawk Valley Bank for 20 years as cashier and as pres. He was an officer at the port of New York 1845–49; member of congress, first as an anti-slavery democrat, afterward as a republican, 1855–61; and treasurer of the United States 1861–75, resigning in the latter year. Though he had received and disbursed hundreds of millions of dollars, an examination, made at his request when he retired, proved his accounts absolutely correct. His last years were spent near Jacksonville, Fla.

SPINNERET, SPINNING, etc.: see under Spin.

SPINNING: the art of combining animal and vegetable fibres into continuous threads fit for the processes of weaving, sewing, or rope-making. The most primitive S. apparatus is the spindle and distaff, representations of which are seen on the earliest Egyptian monuments. The distaff was a stick or staff on which a bundle of the prepared material was loosely bound, and which was held under the left arm or stuck in the belt; the spindle was a smaller tapering piece to which the thread was attached. By a dexterous twirl of the hand, the spindle was made to spin round and at the same time recede from the spinster, who drew out between the fingers of both hands a regular stream of fibres so long as the twisting of the spindle lasted. It was then drawn in, the new length of thread wound upon it, and the operation was renewed. An obvious improvement on this was to set the spindle in a frame and make it revolve by a band passing over a wheel driven either by occasional impetus from the hand or by a treadle; this constituted the *spinning-wheel*, which made its appearance in Europe in the 14th c., having been already known in India. In the spinning-wheel in its most improved form, and as used for flax, a bobbin or 'pirn,' with a separate motion, was placed on the spindle, which had a bent arm—a flyer or flight—for winding the yarn on the bobbin. The spindle and bobbin revolved at different rates, the revolutions of the spindle giving the twist, and

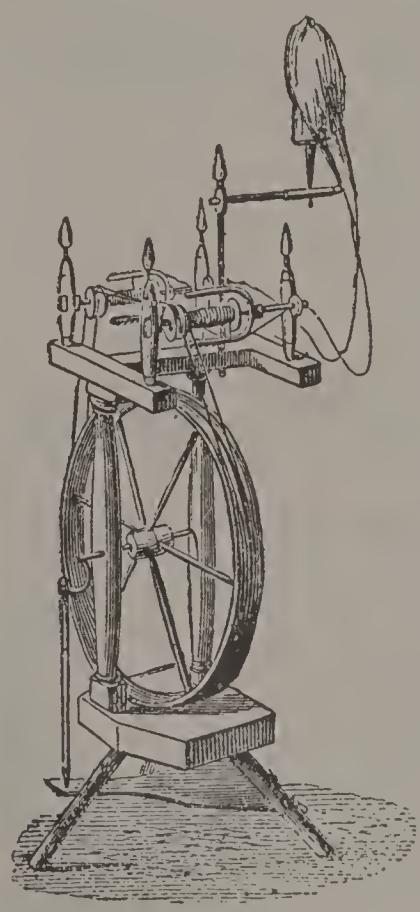


Fig. 1.—Two-handed Spinning-wheel.

the difference of the rate causing the winding on. The two-handed wheel had two spindles and pirns a little apart, with the distaff or 'rock' stuck into the frame between them, and the spinster produced a thread with each hand. The spinning of flax on such wheels for the

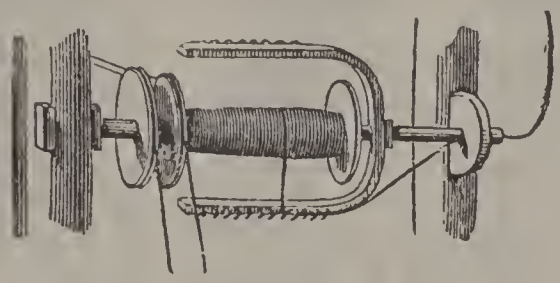


Fig. 2.
Spindle, Bobbin, and Winding-arm on a larger scale.

manufacturer was an important branch of domestic industry as late as 1830, if not later.

Neither the S. wheel nor the hand could spin more than one or at most two threads at a time; therefore, with the rapid increase of population, and improvements in the process of Weaving (q.v.), they became quite inadequate to

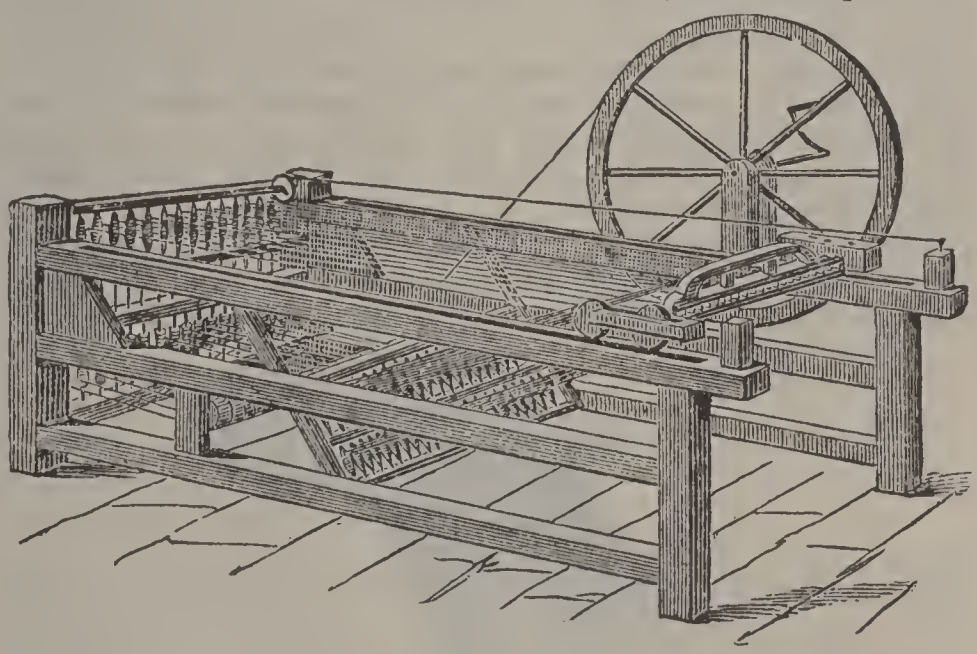


Fig. 3.

supply the demand for yarn: but an accident, it is said, about 1764, led to an invention by which eight threads could be spun at once; and this was soon improved upon until 80 could be produced as easily. This was the invention of the *spinning-jenny* for cotton-spinning, by James Hargreaves (q.v.). In this machine, a number of large reels of cotton formed into a thickish coil, called a *roving*, were set on upright fixed spindles, and the ends of the rovings were passed between two small movable bars of wood placed horizontally and under the control of the spinner, who could thus make them press more or less on the roving, and consequently increase or decrease the draw upon it from the spinning spindles, which were set in a row at

the other end of the frame, and all capable of being set in motion simultaneously by the wheel. The success of the spinning-jenny (fig. 3) was considerable; but even previous to its invention, a better idea had been started and acted on by others, and was afterward brought to such perfection that the invention of Hargreaves soon passed into obscurity.

To understand the operations of S. as now practiced, and as improved by the invention alluded to, it is desirable to advert to the mode of preparing the fibres for spinning. Though the process is essentially the same for wool and cotton, yet each of these fibres requires special manipulations: the treatment of the raw cotton fibre is as follows: First the cotton has to be 'opened;' that is, it must be relieved from its original knotted and lumpy condition: this was done formerly by hand, but is now easily managed by machines. In the opening-machine, or 'opener,' the raw cotton is spread out on a feeding-table, whence it is taken up by a pair of feeding-rollers, and by them subjected to the action of a 'beater.' The beater is a cylinder bearing at intervals rows of projecting teeth: it has a diameter of 18 in. over the teeth, is on the average 40 in. wide, and makes 1,400 revolutions per minute. A strong draught of air is driven through the cotton while in the opener, which carries away the dust and foreign matter adhering to it. The cotton is carried forward between two perforated zinc or wire cylinders connected with the draught, from which it is taken by a pair of rollers and formed into 'laps.' This operation consists in laying the material very equally on an endless apron made of small bars of wood, and of the width of the frame of the machine in which they are placed. This apron (*a*, fig. 4) passes round two

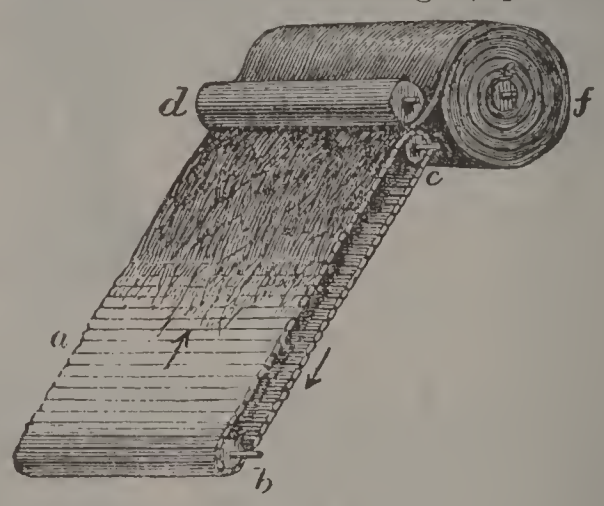


Fig. 4.

rollers a little distance apart, as in fig. 4, *b*, *c*, the rollers being moved by machinery. The arrows indicate the direction in which the apron moves; and as its entire surface receives a thin layer of the fibre, this passes under the roller *d*, and is taken on to the roller *e*, in the form of a compressed layer of cotton or wool, called a *lap*. When the roller *e* is full, it is removed, with its lap *f*, to make way for another. Much care is taken in weighing out and dis-

tributing the material of these laps, because on this first operation the ultimate size of the yarn depends.

The laps are taken to the *carding-machine*, consisting of a series of cylinders revolving in a frame, and placed so close together that they almost touch each other. Each cylinder is covered with a coating of fine steel wire points, which are struck in leather, or some other flexible material, and are technically called *cards*. The production of these cards by machinery is in itself a marvel, and the automatic machines for making them are wonderfully effective. Each piece of wire is bent as in fig. 5, and is put through two holes in the leather, as in fig. 6; *a* shows a bent wire going in, and *b*, *b*, wires completely in the holes in leather, *c*, *c*, *c*, so as to form two points on the other side, and these are slightly bent all in one direction, as in fig. 7, where the piece of card *a* is seen cut through at *b*, to show the direction given to the wires *c*. There are many variations on this arrangement of the wires, but the general principle is the same in all. The machine for making the cards cuts the wire to the right lengths, bends them, pierces the holes in the leather, inserts the wires, and

Fig. 5.

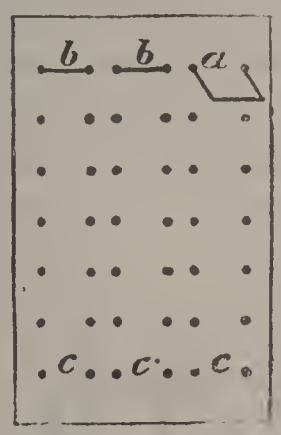


Fig. 6.

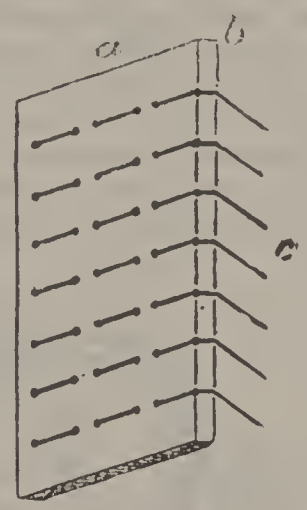


Fig. 7.

finishes by giving them the slight sloping direction which is essential.

The lap is made of the same width as the cylinders of the carding-machine, and is so adjusted that, as it unwinds from its roller, it passes in between a pair of the carding cylinders, whose steel wire teeth seize the individual fibres, and drag them in one direction until they are caught by other cylinders, and so carried from one to another, always being pulled in a straight direction until they are laid as nearly as possible side by side, and are given off in a thin cobweb-like film at the last cylinder, where the film is prevented from continuing its journey round the cylinders by a small bar of metal called the *doffer*, which, with a gentle and peculiar motion, removes it from the cylinder. The film of fibre is of the same width as the cylinder of the carding-machine, but it is taken from the doffer by means of a vibrating comb, and is drawn together into a funnel,

which forms it into a narrow web; then passing through two pairs of calender rollers, it is coiled into a deep tin can in the form of a loose untwisted column of cotton or wool, about an inch in thickness, which is called a *sliver*. A small portion of this arrangement is shown in fig. 8, which represents a carding-machine with only two carded cylinders, *a* and *b*; in practice they are much more numerous. There is also a concave piece of carding, *c*, which was formerly much used, but has given way to additional cylinders—but it makes the action more apparent in a drawing; *d* is the lap drawn on by the action of the two small rollers *e*, *e*, which slightly press it as they revolve. It is quickly distributed all over the surface of the large cylinder *a* by means of its numerous wire-teeth; and as it passes the roller *b*, the teeth of which move in an opposite direction, as indicated by the arrows, the fibres are caught off the large and are carried round the small cylinder until they reach *f*, where they are stripped off by the doffer *g*, and are passed through the ring *h* (a funnel now takes the place of this ring) and the rollers *i*, *i*, into the tin receiver *k*. The sliver is now in the first stage of spinning; it has next to be drawn out very gradually until it is not thicker than a quill; and in drawing it out, the operator gives it a very slight twist, still leaving it so loose in structure that it will break with a slight touch; in this state it is called a *roving;* and it was at this stage that the spinning-jenny began to operate on it. The rovings, which were wound as they were drawn upon large reels, were unwound by the machine, and were still further drawn out and

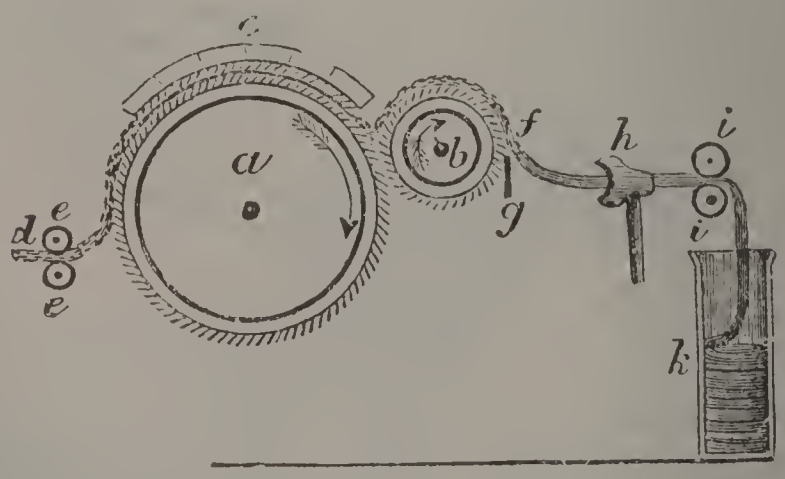


Fig. 8.

firmly twisted and wound on to spindles or cops, the drawing being regulated by the pressure of the wooden bars of the jenny, which was within reach of the operator's hand.

The *throstle-machine*, patented by Arkwright (see ARKWRIGHT, Sir RICHARD) 1769, had for its object the drawing of the rovings through a succession of pairs of rollers, each pair in advance of the others, and moving at different rates of speed. The first pair receive the sliver, compress it, and pass it on to the second pair, which revolve at a greater speed, and thus pull it out to exactly the number

of times greater length that their revolutions exceed those of the other pair—in number it is usually eight times—and as the first roving is passed through a second, third, and sometimes fourth machine, the finished roving may be 32 times longer than the sliver. As the roving issues through the last rollers of each machine, it is received on *spools* or *reels*, calculated to hold a given quantity; and these are transferred to the *spinning-frames*, which resemble the *roving-frames*. Here the roving takes the place of the sliver; and as it unwinds from the spool, is drawn through successive pairs of rollers, moving as before at different rates, each succeeding pair faster than the backward ones, so that the roving gets thinner and thinner, until the tenuity is carried as far as desirable. It is then carried on to a spindle which revolves with great rapidity; and by a simple arrangement is made both to twist the thread and to wind it on the spindle ready for the weaver.

This system produces too great a strain on the thread in its progress to admit of its being drawn so fine as is wanted for many purposes; and this led to the invention of the *mule-jenny* by Crompton (q.v.) 1779, which has a travelling frame upon which the spindles are set. This frame is now made long enough to carry hundreds of spindles, and it gently draws out and twists the thread after it leaves the last pair of rollers; and when it has reached its limits—now several yards, but in Crompton's time only five ft.—it rapidly returns, winding up the spun thread on the spindles as it goes back. These machines are now applied, with various necessary modifications, to cotton, wool, flax, silk, and other textile materials; and their effect on manufactures is as wonderful as anything in the whole history of commerce. Previous to the invention of the mule, few spinners could make yarn of 200 hanks to the pound (the hank being always 840 yards): at the same time, the natives of India were weaving yarn of numbers ranging between 300 and 400. Now manufacturers have reached such perfection that Manchester (England) spinners have made No. 700, which was then woven by a French firm. No 10,000, a pound of which would reach 4,770 miles, has been made as a test of machinery. The most modern machines combine in one the operations of carding, roving, and spinning.

SPINOLA, *spē-nō'lâ* or *spē'no-lâ*, AMBROGIO, Marchese DI: soldier: about 1571–1630, Sep. 25; b. Genoa; of a noble Italian family. He took service with Spain, and 1603 became chief commander of the Spanish army in the Netherlands. He took Ostend 1604, Jülich 1622, and Breda 1625. He afterward commanded Spanish troops in Italy, and died at the siege of Casale in Piedmont.

SPINOZA, *spē-nō'zâ*, BARUCH (= *Benedict*); or, as he in later years signed himself, BENEDICT DE SPINOZA: one of the great philosophers of modern times: 1632, Nov. 24—1677, Feb. 21; b. Amsterdam. His parents, rich Portuguese Jews, had their son diligently instructed in the Bible and its commentaries, and the Talmud. But after having mastered both, and imbibed the philosophical spirit of such commentators as Aben Ezra, he was allowed—the more readily that his sickly constitution unfitted him for a commercial career—to give himself to a life of study. Physical sciences and the writings of Descartes (q.v.), to which first of all he turned, soon drew him away from the rigid belief and practices of the synagogue; and Saul Levi Morteira, his talmudical teacher, who had built fond hopes upon the genius of his pupil, was the first to threaten him with dire punishment if he did not retract the rank heresies that he began to utter. Spinoza, after a time, entirely withdrew from the outward community of his brethren, who—having in vain endeavored first to bribe him with a pension if he would retain at least an outward conformity to the synagogue worship—formally excommunicated him. A fanatic even attempted to frighten him by a real or feigned attack on him in the street at night. At that period (according to some biographers), the young truth-seeker fell in love with the young and beautiful daughter of Van den Ende, his master in Greek and Latin, but was rejected; from which time Philosophy became the sole object of his life. But chronology takes from this statement all except bare possibility: the girl was not more than 11 or 12 years of age when S. left Amsterdam. In accordance with the excellent Jewish custom, S. had, apart from his studies, made himself master of a mechanical craft: he had learned the art of polishing optical lenses, and this now became the means of his subsistence. He was also an expert in the art of design and of portraiture.

When 28 years old he left Amsterdam, and went to Rhynsburg, near Leyden, where he wrote the *Abridgment of the Meditations of Descartes*, with an Appendix—the latter being a kind of first cast of his *Ethics*. The year following he removed to Woorburg, near the Hague, and soon afterward, yielding to solicitations of his, by this time, numerous friends, he removed to the Hague itself. The elector of the Palatinate, Charles Lewis, next offered him a vacant chair of philosophy at the Univ. of Heidelberg, with full 'liberty of teaching,' provided he would not say aught to prejudice the established creed; but S., foreseeing the probable complications and confusion, declined the lucrative and honorable professorship His small earnings were enough for his simple wants. In a similar spirit, he refused generous offers by wealthy friends, like Simon de Vries, who proposed to bequeath to S. his estate. S. insisted that the estate should go to the brother and natural heir; and it was so left, with provision for an annuity for S.'s maintenance. The brother proposed 500 florins as the annuity; but S. declined to take more than

300. An offer of a pension, on the condition of his dedicating a work to Louis XIV., he quietly rejected. His domestic accounts, found after his death, show that he preferred living on a few pence a day, to being indebted to another's bounty. Throughout his short life (44 years) of study, of abstemiousness, of bodily and mental suffering—for his constitution was undermined by consumption and overwork, while his sensitive mind was wrought upon by the violent severance of all natural ties of affection, besides frequent obloquy and persecution—no complaint passed his lips. Simplicity and heroic forbearance, with an antique stoicism and a childlike, sympathizing heart, were the principal attributes of him who was vilified as epicurean and atheist by his contemporaries, and whose name bore this stain for a century after his death.

Respecting Spinoza's philosophical system, of which only the faintest outline can be given here, it must be premised that it developed itself on the basis of Descartes. The latter had inaugurated a new epoch by his 'reconstruction' of knowledge. Dissatisfied both with the dogma and with the skepticism of the philosophy of his day, he cleared the ground by first doubting everything, and then proceeding to lay a new foundation by his *Cognito, ergo sum* (I think, I therefore exist). Spinoza, deeply struck both with the reasonings and conclusions of Descartes, used his 'I think, therefore I exist,' merely as a starting point whence he laid out an altogether different line of thought relative to the Divine existence. Man's consciousness of his own existence and of his imperfect state are not, he thinks, sufficient to solve the grand problem of universal being. He therefore assumes, first of all, as undeniably existing, three fundamental things, which he calls respectively Substance, Attributes, and Mode. By Substance he understands, like Descartes, that which needs nothing else to its existence; but, unlike Descartes, he assumed only One such Substance—the Deity. There is no real difference, he holds, between mind, as represented by God, and matter, as represented by Nature: they are One, and, according to the light under which they are viewed, may be called either God or Nature. The visible world is not distinct from the Deity; it is only His visible manifestation, flowing out of Him who is the ultimate fountain of life and essence, as a finite from the infinite, variety from unity—a unity, however, in which all varieties merge again. Extension and thought, which with Descartes had been two Substances, with Spinoza become 'Attributes'—that which the mind *perceives* as *constituting* Substance. Extension is visible Thought; Thought is invisible Extension. The relation between Substance and Attributes, Spinoza illustrates by that example of an object—colorless in itself—seen through yellow or blue spectacles. And this explains the relation between body and mind, and the complete unity between them. The mind is the idea of the

body—i.e., the same thing considered under the attribute of thought. The *modus* or *accidens* is only the varying form of Substance. Like the curling waves of the ocean, they have no independent existence; nay, less than these are they things of reality; but they are simply the ever-varying shapes of the Substance. Substance, thus, is the only really existing, all-embracing essence, to which belongs everything perceptible to our senses, and not perceptible. Thus, every thought, wish, or feeling is a Mode of God's Attribute of thought; everything visible is a Mode of God's Attribute of extension. God is the 'immanent idea,' the One and All. 'World' does not exist as world—i.e., as an aggregate of single things—but is one complex whole and one peculiar aspect of God's infinite Attribute of extension. The variety that we behold in things is a mere product of our faulty conceptions, particularly of, as Spinoza terms it, our 'imagination,' which perceives unity as a complex of multiplicity.

On these metaphysical speculations he founds his Ethics, which he deduces in mathematical form, after the method of Euclid. The chief doctrines are: The absence of free-will in man—himself only a *Modus* dependent on causes without, and not within him. Will and Liberty belong only to God, who is not limited by any other Substance. Good and Evil are relative notions, and sin is a mere negative; for nothing can be done against God's will, and there is no idea of Evil in Him. Utility alone, in its highest sense, must determine the good and the evil in our mind. Good, or useful, is that which leads us to greater reality, which preserves and exalts our existence. Our real existence is knowledge. Highest knowledge is the knowledge of God. From this arises the highest delight of the spirit. Happiness is not the reward of virtue, but virtue itself, and this is to be attained by a diligent following in God's ways. Sin, evil, negation, etc., are merely things that retard and obstruct this supreme happiness.

Spinoza's system, Pantheism or Atheism, as it has been variously called, may quite as truly be regarded as the most rigid, most abstract Monotheism that can be conceived by man. There is only Substance, only God—naught else. It was natural that this system should be misunderstood as atheism, or as materialism; inasmuch as the word 'substance,' which, with Spinoza, means 'existence,' is, in ordinary language, associated with the idea of matter or body. Be this as it may, 'this most iniquitous and blasphemous human invention,' has become an acknowledged basis of much modern German philosophy; and even devout Christian theologians like Schleiermacher did not hesitate to apply to Spinoza the terms 'pious,' 'virtuous.' Novalis speaks of him as 'that God-intoxicated man.' To Spinoza's thought God was so great and so real that no room was left for any other existence or any other reality. Much of that to which the name Pantheism is given is in fact Materialism—a re-

duction of God to Matter, which thus is left as all the God and as all the reality that is: S.'s Pantheism, however unbalanced and unsafe, refined and spiritualized matter until it vanished as a dream — lost in the infinite deep of the Divine Being.

His principal works are: *Renati Descartes Principiorum Philosophiæ, Pars I. et II., more geometrico demonstratæ* (Amsterdam 1663); *Tractatus Theologico-politicus* (anonymous, 1670); the *Opera Posthuma*, edited in the year of S.'s death by Ludwig Meyer, contain: *Ethica Ordine Geometrico Demonstrata, Tractatus Politicus, Tractatus de Intellectus Emendatione, Epistolæ, Compendium Grammatices Linguæ Hebræ.* Several minor treatises are lost; but the lately discovered *Tractatus de Deo et Homine*, pub. 1862, is a most valuable addition to our materials for tracing the development of S.'s system. The literature on the Spinozistic philosophy is very copious, especially in Germany. S.'s life has even been made by Auerbach the subject of two romances. There are editions of S.'s works by Paulus (1803), Bruder (1846), Van Vloten and Land (1882). See Pollock's *Spinoza* (1880), and Martineau's (1882). The standard life is Freudenthal's *Spinoza, Sein Leben und Seine Lehre* (1904), founded on that author's *Lebensgeschichte Spinoza* (1899). For complete bibliography, see A. von der Linde, *Benedictus Spinoza* (1871), and Grünwold's *Spinoza in Deutschland*, pp. 361–70 (1897).

SPINOZISM, n. *spī-nō zizm:* see SPINOZA.

SPINSTER: see under SPIN.

SPINULE, SPINY, etc.: see under SPINE.

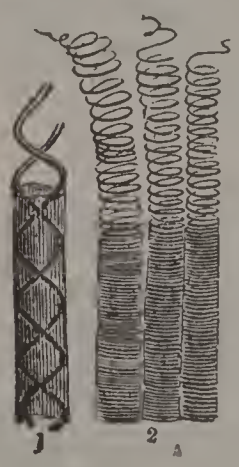
SPIRACLE, n. *spī'rā-kl* [L. *spīrac'ŭlum*, an air-hole — from *spīro*, I breathe]: a breathing-pore; a vent; a passage by which air or other fluid is inhaled or exhaled.

SPIRÆA, n. *spī-rē'ă* [Gr. *speiraia*, a shrubby flower — from *speira*, anything twisted, alluding to the branches being suitable for twisting into garlands]: genus of plants of nat. order *Rosaceæ*, sub-order *Spirææ*, in which the fruit consists of five or fewer capsular carpels. The genus S. has one or more follicular, many-seeded carpels. It contains numerous species, natives of Europe, Asia, and America, herbaceous plants and low deciduous shrubs; of the herbaceous species, are: DROPWORT (*S. Filipendula*), and MEADOW SWEET or QUEEN OF THE MEADOW (*S. Ulmaria*), both cultivated from Europe, and having interruptedly pinnate leaves and flowers in cymes. Dropwort is a native of dry upland pastures; it is tonic and fragrant; and its tubers, somewhat nutritious, are in Sweden ground and made into bread. Meadow Sweet is well known for the powerful fragrance of its flowers. A fragrant distilled water is prepared from them. A N. American species (*S. tomentosa*), called HARDHACK in the United States, is used as tonic and astringent. Many of the shrubby species are frequently planted for ornament, such as *S. callosa* and *S. prunifolia* from Japan; *S. bella* from Nepal; *S. chamædrifolia* and *S. trilobata* from Siberia; *S. lanceolata* from China; *S. hypericifolia*, the Italian May

or St. Peter's Wreath; *S. ariæfolia* from Oregon; and *S. lobata*, its bruised leaves with the odor of Sweet Birch, from the prairies.

SPIRAL, in Geometry: term denoting a class of curves which, during their gradual regression from a point, wind round it repeatedly. Their equations are generally expressed in terms of polar co-ordinates, and all are necessarily of the form $r = f(\theta)$, where θ never signifies a function of the angle, but the angle itself or a multiple of it. Several such curves have received distinguishing epithets, either on account of the properties that they possess, or from their inventors; the chief of them are—the *equable spiral* or the *spiral of Archimedes*, whose equation is $r = a\theta$, and which, commencing at the origin, circles round and regredes from it with unvarying uniformity; the *hyperbolic* or *reciprocal spiral* ($r\theta = a$); the *logarithmic* or *equiangular spiral* ($r = ab^{\theta}$); which recedes from the centre or origin with a velocity increasing as the distance, and always cuts the radius vector at the same angle; etc.

SPIRAL VESSELS, in Botany: long and delicate air-tubes in the cellular tissue of plants, which run unbranched through the different parts of the plant, and whose walls are composed of fibres spirally or circularly twined. S. V. are either *free*, when their windings are unconnected with each other; or *net-like*, when the windings are involved with each other in a net-like manner. If the free spaces between the convolutions in the latter are linear, they form *lined* vessels; if point-like, they form *punctate* or *porose* vessels. S. V., whose walls are formed of distinct horizontal rings, placed simply one above another, are called *annular* vessels. S. V. seldom occur singly, but are usually united by cells into bundles called vascular bundles. These vascular bundles are scattered in the stems of endogenous plants; but in the stems of exogenous plants they are arranged in one or more concentric circles. Among cryptogamous plants, the ferns alone (in the most extensive signification of the term) are provided with S. V. All plants which have S. V. are called *Vascular Plants*, in distinction from *Cellular Plants*, whose substance consists of cells only.



Spiral Vessels.

The laws by which the spiral form is assumed by S. V. are unknown; though the question has naturally been regarded as having intimate connection with the tendency to spiral structure manifested in plants, and even in some of those cryptogamous plants in which no true spiral vessels are found; a tendency observed not only in spiral stems, spiral tendrils, the spiral fibres of the elaters of *Jungermanniæ*, and the like, but throughout the vegetable kingdom in the spiral arrangement of leaves and of the organs formed by metamorphosis of leaves. The whole subject remains extremely difficult.

SPIRAL WINGED VALVE: a lift valve, the wings of which, instead of being placed at right angles to the seat, are arranged as sections of a spiral of very long pitch. By this arrangement, the valve is turned around a little on its seat at each lift, and its wear is rendered more uniform.

SPIRANT, a. *spī'rănt* [L. *spīrans* or *spīran'tem*, breathing—from *spīro*, I breathe]: a name applied to the consonants *y*, *s*, *v*, from their continuous open sounds, and sometimes to *l* and *r*.

SPIRE, n. *spīr* [F. *spire*, a coil or fold—from L. *spīra*, a twist, a wreath—from Gr. *speira*, a coil, a wreath; anything wreathed or twisted; a spiral; a coil; a curl; a wreath; the whorls of a shell except the lowest. SPIRY, a. *spī'rĭ*, curled; coiled; wreathed. SPI'RAL, a. *-răl*, winding like a screw: N. in *geom.*, a curve or curved line receding continually from the centre about which it revolves (see SPIRAL, in Geom.). SPI'RALLY, ad. *-lĭ*.

SPIRE, n. *spīr* [Sw. *spira*, a rod, a pointed steeple: Dan. *spire*, a germ, a sprout: AS. *spír*, a spike of a reed]: the part of a body tapering to a point; the tapering point of a steeple, rising from the tower: a stalk or blade of grass; the top or uppermost point: V. to shoot up to a point; to sprout. SPI'RING, imp. SPIRED, pp. *spīrd:* ADJ. having a spire.—Spire in *arch.*, is a very acute pyramid, or sometimes a large pinnacle, constituting the roof of a tower. The history of spires is obscure, but there is no doubt that the earliest specimens are the

1, Turret, St. Peter's Church, Oxford; 2, Turret, Rochester Cathedral; 3, St. Mary's Church, Cheltenham; 4, Bayeux Church, Normandy.

(From Parker's Glossary of Architecture.)

pyramidal roofs of the turrets of Norman date. Those of St. Peter's, Oxford, England (fig. 1), and Rochester Cathedral, England (fig. 2), are good specimens of cir-

cular and octagonal spires on a small scale. Spires of this early period are much lower than those of later date. The early English style has spires of acute form over the larger towers. They are generally what are termed broach spires, i.e., the slopes spring from the cornice of the tower without any parapet, and at the point where the square changes to the octagon, there is a small set-off or separate roof. (Fig. 3, St. Mary's, Cheltenham, England, indicates this arrangement.) Sometimes the angles at top of towers were occupied with pinnacles or sloping masses of masonry, as at Bayeux Cathedral, Normandy (fig. 4).

In the Decorated style, the spires were more enriched, with a parapet and pinnacles at the top of the tower, crochets on the angles, and enriched windows.

The spires of the Perpendicular and Flamboyant styles are still more enriched, with flying buttresses at the angles, etc. They are sometimes perforated, and the sides of the spire filled entirely with tracery. Such spires are common in Germany, those of Strasbourg and Frieburg on the Rhine being very fine examples. As in the later styles generally, the character and beauty of the spire give place to dexterity in masonry, and many examples exist of traceried spires more wonderful than beautiful.—See GOTHIC ARCHITECTURE. Some of the historic spires of English and European churches are of timber, covered with lead in sheets or with shingles; but most of them are of stone.

SPIRES (city). See SPEIER.

SPIRILLUM, n. *spī-rĭl'lŭm,* SPIRILLA, n. plu. *spī-rĭl'lă* [L. *spīra;* Gr. *speira,* a coil, a fold]: a small genus of bacteria, or of protozoa, characterized, when growing in long filaments, by their twisted or corkscrew-like appearance. Most of them are motile, and many form spores. They mostly inhabit water. One disease-producing spirillum is *Spirillum obermeiri,* the cause of relapsing fever. The name by which this form of organism is now known is *Spirochæte* or *Spirochæta.* It is as yet undecided whether it belongs to the vegetable kingdom (Bacteria), or the animal kingdom (Protozoa), but the probability is that it will finally be classed among the animal micro-organisms. Another important species is *Spirochæte pellida,* a micro-organism which is associated with, and probably the specific cause of syphilis. *Spirochæ pertennis* is found associated with yaws. The genus is also called *Treponema,* the species mentioned above being *T. pellidum* and *T. pertenne.*

SPIRIT, n. *spĭr'ĭt* [L. *spīrĭtus,* breath, the breath of life, a spirit—from *spīro,* I breathe: It. *spirito:* F. *esprit*]: an intelligent being imperceptible to the senses; an immaterial substance; in *popular usage,* the soul of man (see SOUL); a spectre or ghost: ardor; courage; temper or disposition of mind; the intellectual powers of man, as distinct from the body; turn of mind; power

of mind, moral or intellectual; a man of life, fire, and enterprise; purest part of a body; essential quality; a liquid, as brandy, whisky, or rum, obtained by distilling a fermented vegetable extract (see below): real meaning, as opposed to the *letter:* in *Scrip.*, sometimes the renewed nature of man; the immortal part of man: pre-eminently, the *Holy Spirit* of God: anything eminently pure and refined: V. to convey away rapidly and secretly. SPIR'ITING, imp.: N. the service of a spirit—hence, work done well and quickly. SPIR'ITED, pp.: ADJ. full of animation and life; ardent; vivacious; courageous; in *composition*, denoting the state of the mind, or the character of the disposition, as high-spirited, low-spirited. SPIR'ITEDLY, ad. *-ĕd-lĭ.* SPIR'ITEDNESS, n. *-nĕs,* state of being spirited; animation; disposition of mind. SPIR'ITS, n. plu. *-ĭts,* excitement of mind; natural vivacity: persons distinguished by certain qualities of mind, as, 'the choice and master *spirits* of this age:' fluids containing more than half their bulk of absolute alcohol (see SPIRIT); such alcoholic liquids as are intended for drinking. SPIR'ITIST, n. *-ĭt-ĭst* (less properly, SPIRITUALIST), one who believes in intercourse between the living and the dead by sensible tokens. SPIR'ITLESS, a. *-lĕs,* lacking in vigor; dull; dejected; having no breath. SPIR'ITLESSLY, ad. *-lĭ.* SPIR'ITLESSNESS, n. *-nĕs,* state of being spiritless; lack of life or vigor. SPIR'ITUOUS, a. *-ĭt-ū-ŭs,* containing ardent spirit, or possessing its qualities; light; volatile. SPIR'ITUOUSNESS, n. *-nĕs,* quality of being spirituous. SPIR'ITOUS, a. *-ŭs,* in *OE.*, refined; resembling spirit. SPIR'ITO'SO, ad. *-ĭt-ō'zō* [It., spirited]: in *music,* with spirit. SPIRIT-DEALER or -MERCHANT, one who has a license to sell spirituous liquors. SPIRIT-LAMP, lamp in which alcohol is burned instead of oil. SPIRIT-LEVEL, glass tube nearly filled with spirits of wine or distilled water, hermetically sealed, and fixed on a case of wood or other substance, used to ascertain whether a surface be horizontal or perfectly flat. SPIRIT-RAPPER, one who claims to have intercourse with spirits, and who alleges that they manifest their presence and convey intelligence by means of audible raps or knocks. SPIRIT-RAPPING, alleged manifestation of the presence of spirits by audible or visible signs; the belief in such. SPIRIT OF SALT, familiar name for muriatic acid. SPIRITS OF WINE, familiar name for Alcohol—so called because formerly extracted only from wine. ANIMAL SPIRITS, the fluid supposed to circulate through the nerves, and regarded as the agent of sensation and motion; the nervous fluid or nervous principle: briskness or gayety of disposition. THE SPIRIT, the Third Distinction or Subsistence (usually termed Person) in the Holy Trinity. THE SPIRIT, the immortal part of man. RECTIFIED SPIRIT, proof-spirit made purer by further distillation. SPIRITS OF HARTSHORN, impure carbonate of ammonia. SPIRITS OF TURPENTINE, volatile and very inflammable oil distilled from

turpentine. To SPIRIT AWAY, to snatch or allure away secretly.—SYN. of 'spirit, n.': life;; soul; breath; fire; ardor; enthusiasm; earnestness; courage; animation; vivacity; eagerness; desire; enterprise; cheerfulness; mind; intellect; intent; spectre; ghost; apparition; sentiment; perception;—of 'spirited': animated; lively; vivacious; active; bold; courageous; ardent.

SPIRIT: term of very general application to fluids, mostly of lighter specific character than water, and obtained by distillation; thus the essential oil of turpentine is called Spirit of Turpentine. In a stricter sense, the term spirit is understood to mean Alcohol in its potable condition, whose numerous varieties derive their special characters from the substances used in their production.

SPIRIT DUCK. See GARROT.

SPIRITISM. See SPIRITUALISM.

SPI'RITO SAN'TO. See ESPIRITU SANTO.

SPIRITUAL, a. *spĭr'ĭt-ū-ăl* [F. *spirituel*, spiritual—from L. *spiritŭālis*, spiritual—from *spīrĭtus*, breath, spirit (see SPIRIT)]: not material; not gross; possessing the nature or qualities of a spiritual being; not lay or temporal; pertaining to sacred things; pure; holy. SPIR'ITUALLY, ad. *-lĭ*. SPIR'ITUAL'ITY, n. *-ăl'ĭ-tĭ* [F. *spiritualité*—from L.]: essence, as distinct from matter; spiritual nature; that which belongs to the church or to religion. SPIR'ITUALIZE, v. *-ăl-īz*, to refine; to free from grossness or sensuality; to purify; to convert to a spiritual meaning. SPIR'ITUALIZING, imp. SPIR'ITUALIZED, pp. *-īzd*. SPIR'ITUALI'ZER, n. *-ī'zĕr*, one who spiritualizes. SPIR'ITUALIZA'TION, n. *-ĭ-zā'shŭn*, the act of spiritualizing. SPIR'ITUALISM, n. *-ĭzm*, in *philos.*, the system which teaches that all that is real is spirit, soul, or self; that system which regards the external world as either a succession of notions impressed on the mind by the Deity, or else the mere educt of the mind itself: philosophic system opposed to MATERIALISM (q.v.—also the references there given): also the belief in the frequent communications from the world of departed spirits, as manifested by visible or audible signs; spirit-rapping and the many allied manifestations (in this sense, more properly SPIRITISM). SPIR'ITUALIST, n. *-ĭst*, one who professes regard for spiritual things only, or a belief in them; the opposite of *materialist:* also one who believes in direct intercourse with departed spirits (in this sense, more properly SPIRITIST). SPIR'ITUALIS'TIC, a. *-ĭs'tĭk*, relating to spiritualism in philosophy. SPIR'ITUALNESS, n. *-nĕs*, the state or quality of being spiritual. SPIR'ITUALTY, n. *-ĭt-ū-ăl-tĭ*, in *OE.*, the ecclesiastical body; the whole clergy of the church. SPIRITUAL COURT, an ecclesiastical court. SPIRITUAL-MINDEDNESS, the state of having devout and holy affections.

SPIRITUALISM.

SPIRITUALISM, or SPIRITISM, *spĭr'ĭt-ĭzm:* belief in intercourse with disembodied spirits through the agency of persons having peculiar susceptibilities, called mediums: also the theories and practice developed from such belief. The belief in occasional intercourse with departed spirits is probably as old as the belief in human immortality, and seems to have permeated the religions of all nations in all ages. A well authenticated case in England is from the pen of the Rev. Joseph Glanvil, chaplain-in-ordinary to King Charles II. of England, who reports that a house was for two years (1661-63) visited by a spirit, or spirits, who beat tattoos on the roof and sides of the house, caused chairs and tables to move around the rooms, and made other noisy demonstrations: it is notable that he states also that the unseen visitants made answer by knocks—the first recorded instance of such communication of intelligence. A well authenticated case similar to the above is the mysterious disturbance at the parsonage of the Rev. Samuel Wesley, father of John Wesley, at Epworth, as recorded by Adam Clark, LL.D., F.A.S., in *Memoirs of the Wesley Family.* He states that for two months (1716, Dec.—1717, Jan.) unaccountable phenomena were witnessed by all the household and by a number of neighbors and clergymen invited by Mr. Wesley to investigate them. These disturbances were loud knockings, opening and closing of doors, sounds as of footsteps going up and down stairs, the turning of a hand-mill in the attic, groans, and other noises so boisterous as to prevent the family from sleeping. Thrice was Mr. Wesley pushed by an invisible force; and a large mastiff belonging to the family is said to have indicated the approach of the disturbance by various signs of fear. There are many cases of this kind reported during the 18th century and later, but in all these cases the disturbances ceased as suddenly and unexpectedly as they had begun. In this country, similar phenomena, authenticated by many witnesses of the highest credibility and intelligence, occurred in the parsonage of the Rev. Dr. Phelps, minister of the First Church, Stratford, Conn.—a widely-known divine, father of Prof. Austin Phelps, D.D., of Andover Theol. Seminary.

The modern revival of spiritualism as a system developing intelligible communication, originated in the little village of Hydeville, Wayne co., N. Y., in the family of John D. Fox, who, 1848, Dec., began to hear knockings in the house, which toward the end of March increased in loudness and frequency. These knocks seemed connected with the two children, Margaret and Kate, aged 12 and 9 years respectively; or as Margaret declared (1888) 8 and 6½ years respectively; and the mother's attention being attracted by what seemed significance, or intelligent responsiveness in the knockings, she asked questions which were promptly answered by

raps. These manifestations continued, occasioning much excitement in the village. Reports of these occurrences spread with great rapidity; and mediums were developed and circles for investigation were formed in numerous places; and not only were the rappings obtained, but new phenomena were developed. These were of various kinds—some of them similar to those long observed under Animal Magnetism (see, as to France, the correspondence of Billault and Deleuze, 2 vols. 1836): see HYPNOTISM: TRANCE. In *Forty Years of American Life,* by Thomas Low Nichols, M.D., the following are among the assertions made, which are typical of other alleged spiritualistic phenomena: 'Dials were made with movable hands, which pointed out letters and answered questions without apparent human aid. The hands of mediums, acting convulsively, and as they averred, without their volition, wrote things apparently beyond their knowledge, in documents purporting to be signed by departed spirits: their writings were sometimes made upside down, or reversed so as to be read only through the paper or in a mirror. Some mediums wrote with both hands at a time, different messages, *without,* as they said, being conscious of either. There were speaking mediums, who declared themselves merely passive instruments of the spirits. Some represented, faithfully, it was said, the actions, voices, and appearance of persons long dead; others, blindfolded, drew portraits, said to be likenesses of deceased persons whom they had never seen—the ordinary work of hours being done in a few minutes. Ponderous bodies, as heavy dining-tables and pianofortes, were raised from the floor: tables on which several persons were seated were raised into the air by some invisible force. Mediums are said to have been raised into the air, and floated about above the heads of the spectators. Persons were touched by invisible, and sometimes by visible hands. Various musical instruments were played upon without visible agency. Strange feats of legerdemain, as the untying of complicated rope-knottings in an incredibly short time, astonished many.' These feats of untying rope-knottings were exhibited by the Davenport brothers throughout the country. Their detection and exposure, which were claimed and published after some years, have not been acknowledged by them, and are not accepted as genuine by spiritualists.

In England, reports of these marvels were generally received with ridicule and contempt. The visit to London by Mrs. Hayden, American medium, 1852, first excited public interest in spiritualism. Among those convinced by her was Robert Owen, founder of English Socialism, whose son Robert Dale Owen also became a believer. In 1855 a more remarkable medium arrived in England, Daniel Douglas Home. The manifestations which occurred in his presence were soon the subject of newspaper controversy. A full account of Home's strange experiences is in his autobiography, *Incidents in My*

Life. In 1869, Jan., the London Dialectical Soc. appointed a committee 'to investigate the phenomena alleged to be spiritual manifestations, and to report thereon.' The evidence thus collected was presented 1871, July, in their report, with minutes, etc.—a vol. of 412 large octavo pages.—The committee presented evidence of facts, but offered no explanation.

Among notable scientific investigators of spiritualism is William Crookes, F.R.S., discoverer of the metal thallium, editor of the *Chemical News* and of the *Quarterly Journal of Science* In the latter journal, 1874, Jan., is his article, 'Notes of an Inquiry into the Phenomena called Spiritual, 1870-73.' He attests phenomena similar to those affirmed by the Dialectical Society's committee and its witnesses, which came under his notice in his own house, in the light, and with only private friends present except the medium, at times appointed by himself, and under circumstances which, he says, absolutely precluded instrumental aids. Another distinguished leader in natural science, Alfred Russel Wallace, also is a believer in the facts of spiritualism and of mediumship.

One of the phases of spiritualism is 'spirit photographs.' On clean and previously unused plates, marked by the sitter, and even when the sitter has used his own plates and camera, there is stated to have appeared with the sitter a second figure; such figures in many instances have been recognized as portraits of deceased relatives and friends. They have been obtained by many photographers, professional and amateur, in the United States, England, and on the continent of Europe.

In accounting for the strange phenomena of spiritualism there is as yet no consensus of opinion. The result of the most carefully conducted scientific investigations has been such as to lead most psychologists to believe that fraud, hypnotism, unconscious suggestion and the aid of confederates will explain all the demonstrable facts. Under stringent conditions to prevent fraud and collusion many of the alleged phenomena fail to appear. However, not a few distinguished psychologists maintain that certain facts are indisputably established which cannot be so explained. Various hypotheses, e.g., telepathy (q.v.) are introduced to account for this residuum. A multitude of mediums have been proved to be impostors, and have been exposed by scientific investigators and by spiritualists themselves. Even recognized mediums, in whose presence some phases of the phenomena have been honestly produced, have been detected in attempting to imitate the more remarkable phenomena beyond their scope but produced in the presence of other mediums. A fact remarkable in the history of spiritualism is the confession by one of the Fox sisters (Mrs. Margaret [Fox] Kane), more than 40 years after the unaccountable events at Hydeville and Rochester, that those manifestations were produced by her and her sister Kate in the mischievous waywardness of childhood,

by trick and device; and that their persistence in the fraud was due to an older sister. Her confession was published in the New York *World*, 1888, Aug. 21; and her sister Kate has publicly expressed her acceptance of this confession as her own. The two sisters have also shown to public assemblies how their spirit-rapping was done. On due consideration, however, this confession—whether little weight be attached to it, or even great weight as concerns the rappings through the agency of the two sisters—yet, in candid judgment, leaves untouched the wide range and great variety of phenomena later developed which exist as facts for thorough investigation Much argument against spiritualism is based on the asserted injurious tendency of some of its modern developments: this department in the discussion is open for both sides. Moreover, while it is only reasonable to refuse to accept the spiritual origin of any given communication without full proof, there seems an inconsistency when a believer in any of the world's great religions distinctly denies as a general principle the *possibility* of any such communication; inasmuch as all these religions either declare or imply such communication as, at various times, a fact. The value of any such proved communication is, of course, open to debate. Inasmuch as man, scientific man, has yet some things to learn about himself and the universe of matter and spirit—one of the unexplored regions now opening to investigation may comprise materials for one or even more new sciences. Of these sciences, one may be the modes and laws of the influence which one mind or spirit may exert on, or may receive from, another; while another science may concern that 'borderland' of the interaction between the spiritual and the material forces in man's being and in the sphere in which man's life is cast.

See *Researches in the Phenomena*, by Crookes (1874); *From Matter to Spirit*, by Mrs. De Morgan, preface by Prof. De Morgan; *The Two Worlds*, by Thomas Brevior; *Footfalls on the Boundary of Another World*, and *The Debatable Land*, by William Howitt; *A Defense of Spiritualism*, by Alfred Russel Wallace; *Lights and Shadows of Spiritualism*, by D. D. Home (1877); *Report of the London Dialectical Soc. on Spiritualism* (1871); General *Reports* of the London Soc. for Psychical Research; *Nature's Divine Revelations*, by Andrew Jackson Davis (New York 1847—a notable book): also for philosophical discussion, *Mesmerism, Spiritualism, etc., Historically and Scientifically Considered*, by W. B. Carpenter, F.R.S. (1877); Jastrow, *Fact and Fable in Psychology* (1900); *The Subconscious* (1906).

Spiritualism has scarcely taken a definite systematic development; its numerous adherents are to some extent organized, but are not bound by any formal statement of doctrine Its believers in the United States are estimated at four or five millions, besides very many who,

accepting its main facts and some of its elementary principles, remain in various denominational connections or outside of all churches. The spiritualists of the United States in their 5th national convention at Rochester, N. Y., 1868, Aug. 26-28, organized the American Association of Spiritualists; and embodied what they deemed the essential truths of spiritualism in the following 'Resolutions.'—1. That man has a spiritual nature as well as a corporeal; in other words, that the real man is a spirit, which spirit has an organized form, composed of spiritual substance, with parts and organs corresponding to those of the corporeal body. 2. That man, as a spirit, is immortal, and has continued identity. Being found to survive that change called physical death, it may be reasonably supposed that he will survive all future vicissitudes. 3. That there is a spirit-world, with its substantial realities, objective as well as subjective. 4. That the process of physical death in no way essentially transforms the mental constitution or the moral character of those who experience it. 5. That happiness or suffering in the spirit-world, as in this, depends not on arbitrary decree, or special provision, but on character, aspirations, and degree of harmonization, or of personal conformity to universal and divine law. 6. Hence, that the experiences and attainments of this life lay the foundation on which the next commences. 7. That since growth is the law of the human being in the present life, and since the process called death is in fact but a birth into another condition of life, retaining all the advantages gained in the experiences of this life, it may be inferred that growth, development, or progression is the endless destiny of the human spirit. 8. That the spirit world is near or around, and interblended with our present state of existence; and hence that we are constantly under the cognizance and influence of spiritual beings. 9. That as individuals are passing from the earthly to the spirit-world in all stages of mental and moral growth, that world includes all grades of character from the lowest to the highest. 10. That since happiness and misery depend on internal states rather than on external surroundings, there must be as many grades of each in the spirit-world as there are shades of character—each gravitating to his own place by the natural law of affinity. 11. That communications from the spirit-world, whether by mental impression, inspiration, or any other mode of transmission, are not necessarily infallible truths, but on the contrary partake unavoidably of the imperfections of the minds from which they emanate, and of the channels through which they come, and are, moreover, liable to misinterpretation by those to whom they are addressed. 12. Hence, that no inspired communication, in this or any past age (whatever claims may be or have been set up as to its source), is authoritative any further than it expresses truth to the individual consciousness, which last

is the final standard to which all inspired or spiritual teachings must be brought for test. 13. That inspiration, or the influx of ideas and promptings from the spirit-world, is not a miracle of a past age, but a perpetual fact, the ceaseless method of the divine economy for human elevation. 14. That all angelic and all demoniac beings which have manifested themselves, or interposed in human affairs, in the past, were simply disembodied human spirits, or beings of like character and origin, in different grades of advancement. 15. That all authentic miracles (so called) in the past, such as the raising of the apparently dead, the healing of the sick by the laying on of hands or other simple means, power over deadly poisons, the movement of physical objects without visible instrumentality, etc., have been produced in harmony with universal laws, and hence may be repeated at any time under suitable conditions. 16. That the causes of all phenomena—the sources of all power, life, and intelligence—are to be sought for in the internal or spiritual realm, not in the external or material. 17. That the chain of causation, traced backward from what we see in nature and in man, leads inevitably to a Creative Spirit, who must be not only a *fount of life* (love), but a *forming principle* (wisdom)—thus sustaining the dual parental relations of Father and Mother to all individualized intelligence, who, consequently, are all brethren. 18. That man, as the offspring of this Infinite Parent, is in some sense His image or finite embodiment; and that, by virtue of this parentage, each human being is, or has, in his inmost nature, a germ of divinity—an incorruptible offshoot of the divine essence, which is ever prompting to good and right. 19. That all evil in man is in harmony with this divine principle; and hence whatever prompts and aids man to bring his external nature into subjection to, and harmony with, the divine in him—in whatever religious system or formula it may be embodied—is a 'means of salvation' from evil. 20. That the hearty and intelligent conviction of these truths, with a realization of spirit-communion, tends—1st. To enkindle lofty desires and spiritual aspirations, an effect opposite to that of materialism, which limits existence to the present life. 2d. To deliver from painful fears of death, and dread of imaginary evils consequent thereupon, as well as to prevent inordinate sorrow and mourning for deceased friends. 3d. To give a rational and inviting conception of the after-life to those who use the present worthily. 4th. To stimulate to the highest possible uses of the present life, in view of its momentous relations to the future. 5th. To energize the soul in all that is good and elevating, and to restrain from all that is evil and impure. This must result, according to the laws of moral influence, from a knowledge of the constant pressure or cognizance of the loved and the pure. 6th. To promote our earnest endeavors, by purity of life, by unselfishness, and by loftiness

of aspiration, to live constantly *en rapport* with the higher conditions of spirit-life and thought. 7th. To stimulate the mind to the largest investigation and the freest thought on all subjects, especially on the vital themes of spiritual philosophy and duty, that we may be qualified to judge for ourselves what is right and true. 8th. To deliver from all bondage to authority, whether vested in creed, book, or church, except that of received truth. 9th. To cultivate self-reliance and careful investigation by taking away the support of authorities, and leaving each mind to exercise its own truth-determining powers. 10th. To quicken all philanthropic impulses, stimulating to enlightened and unselfish labors for universal human good, under the encouraging assurance that the redeemed and exalted spirits of our race, instead of retiring to idle away an eternity of inglorious ease, are encompassing us about as a great cloud of witnesses, inspiring us to the work, and aiding it forward to a certain and glorious issue.

The growth of spiritualism on both sides of the Atlantic has been extensive. In recent years it has had large growth through its camp-meetings. In many states there are camp-meeting grounds where its adherents and mediums assemble once a year. Many thousand people visit these camps to witness the phenomena there produced. Among the latest manifestations are the almost instantaneous oil-paintings on slates, as produced at Cassadaga, N. Y., 1891, Aug.; writing inside of sealed envelopes; and the receiving of communication between two slates that are closed together. The most popular and noted camp-meetings are at Lake Pleasant, Mass.; Onset, Mass.; Cassadaga, N. Y.; and Lookout Mountain, Tenn. Lake Pleasant has perhaps the largest attendance, 10 to 15 thousand. Cassadaga has about 200 cottages, and a summer-school. There are about 30 minor camps. Seven periodicals in the interest of spiritualism are published in this country; and there are periodicals in England, France, Germany, Italy, and South America.

Besides the works mentioned the following books may be consulted: Edmonds and Dexter, *Spiritualism* (1853); Kardec, *Livre des Esprits* (1853); Zöllner, *Transcendental Physics;* Wallace, *Miracles and Modern Spiritualism* (1881); Wundt, *Der Spiritismus* (1879); Aksakoff, *Animismus und Spiritismus* (1890); Adare, *Experiences with D. D. Home;* Brofferi, *Perlo Spiritismo* (1893); Moses, *Spirit Identity* (1879); Van Hartman, *Der Spiritismus* (1885); Peebles, *Immortality, and Our Employments Hereafter;* Babbitt, *Religion as Revealed by the Material and Spiritual Universe;* King, *Real Life in Spirit Land;* J. R. Francis, *The Cyclopedia of Death;* Hull, *Encyclopedia of Biblical Spiritualism;* Epes Sargent, *Scientific Basis of Spiritualism.*

SPIRITUS ASPER, n. *spĭr'ĭ-tŭs ăs'pĕr* [L. *spīrĭtus*, a breathing; *asper*, rough]: in *Gr. gram.*, a mark thus (') placed before certain words beginning with a vowel, to indicate that such should be pronounced like words beginning with vocal *h* in Eng.; also placed over Gr. *ρ*, Eng. *r*. SPIR'ITUS LENIS, n. *lē'nĭs* [L. *lēnĭs*, soft]: the mark (') denoting the soft breathing.

SPIRKET, n. *spĕr'kĕt* [etym. doubt.]: large wooden peg: in *ship-build.*, a space fore and aft between floor-timbers or futtocks of a ship's frame; distance between rungs.

SPIROID, n. *spīr'oyd* [Gr. *speira*, a coil, a fold; *eidos*, resemblance]: resembling a spiral. SPIROIDEA, n. plu. *spīr-oy'dĕ-ă*, spiral vessels: see under SPIRE 2. SPIROLOBEÆ, n. plu. *spīr'ŏ-lō'bē-ē* [Gr. *lobos*, a lobe]: in *bot.*, Cruciferæ which have the cotyledons folded transversely and the radicle dorsal.

SPIROMETER, n. *spī-rŏm'ĕ-tĕr* [L. *spīro*, I breathe: Gr. *metron*, a measure]: an instr. for measuring the quantity of air an individual can expire after a forced inspiration.

SPIROPTERA, n. plu. *spī-rŏp'tĕr-ă* [L. *spīra*, a coil, a convolution; Gr. *pterŏn*, a wing]: a genus of intestinal parasites whose species are found in various animals.

SPIRT, v. *spĕrt* [Bav. *sprutzen*, to sprinkle: Sw. *spruta*, to spirt (see SPURT)]: to throw out in a jet or stream, as a liquid; to gush out in a small stream, as a liquid from a cask; to spurt: N. a sudden rushing of a liquid substance from a small tube or orifice; a jet. SPIRT'ING, imp. SPIRT'ED, pp. SPIRTLE, v. *spĕrt'l*. SPIRT'LING, imp. *-lĭng*. SPIRT'LED, pp. *-ld*, in the same sense.

SPIRULA, *spĭr'ū-la*: genus of the family *Spirulidæ*, belonging to the ten-armed division of the two-gilled order of Cephalopods, the highest of mollusks. The small, spiral, chambered shell is internal. The living animal is rarely obtained, inhabiting the warmer seas, but the shells are scattered by thousands on some of the E. India coasts, and occasionally carried by the Gulf Stream to the shores of Europe. The animal has an oblong body, with small terminal fins; arms with 6 rows of minute cups; and long tentacles. There are several species. A disk at the hind extremity of the body, perhaps adhesive and indicating a sedentary habit, is possessed by no other known cephalopod. The U. S. coast-survey steamer dredged a living S. from a depth of 950 fathoms, 1878. In 1879 Prof. Owen showed that the shell is not wholly internal, is the fulcrum of muscles of the funnel, head, and arms, and contains part of the liver in its last chamber. If, as some think, the ammonites were dibranchiate, the S. may be the last and interesting vestige of that extinct family.

SPIRY: see under SPIRE 2.

SPIT, n. *spĭt* [AS. *spitu*; Dut. *spit*; Dan. *spid*, a spit: Icel. *spita*, a peg, a skewer: Sw. *speta*, a little rod: Ger. *spiess*, a spear, a spit]: a long thin bar of wood or metal, pointed at one or both ends, on which meat, etc., is roasted; a small point of land running into the sea, or a long narrow

shoal from the shore into the sea, as a *spit* of sand: V. to put on a spit; to thrust through, as meat by a spit; to pierce. SPIT'TING, imp. SPIT'TED, pp.

SPIT, v. *spĭt* [AS. *spittan, spætan;* Icel. *spyta;* Dan. *spytte;* Ger. *spützen;* L. *sputārĕ, spuĕrĕ,* to spit]: to throw out, as saliva from the mouth; to eject from the mouth; to rain slightly: N. spittle; saliva. SPAT, pt. *spăt,* did spit. SPITTEN, pp. *spĭt'tn,* or SPIT, pp. *spĭt.* SPITTLE, n. *spĭt'tl,* saliva; the moisture thrown out from the mouth. SPIT'TOON, n. *spĭt-tôn',* a shallow box to receive the spittle thrown out of the mouth. SPIT'FIRE, n. *-fīr,* a violent passionate person. TO SPIT UPON, to insult grossly; to treat with contempt.

SPITAL, or SPITTLE, n. *spĭt'tl* [a corruption of HOSPITAL, which see: comp. Norw. *spedalsk,* a leper]: in *OE.,* originally a lazar-house or house for lepers; subsequently applied to a *hospital* or almshouse of any kind; a name designating many places in Eng. and Scot. from the fact of the existence in them of lazar-houses or hospitals.

SPITALFIELDS. *spĭt'al-fēldz:* district of London, adjoining Bethnal Green; named from the *Hospital* of St. Mary, founded there 1197 by Walter Brune and his wife Rosia. The dist. is inhabited chiefly by silk-weavers and other poor people. The manufacture of silk was established in S. by emigrants from France, after revocation of the Edict of Nantes.

SPITCH-COCK, v. *spĭch'kŏk* [Eng. *spit,* and *cook*]: to dress an eel with condiments, etc., after splitting it longwise, then broiling it: N. an eel so dressed and cooked. SPITCH-COCKED, a. *-kŏkt,* split and cooked, as an eel.

SPITE, n. *spīt* [Dut. *spijt;* Low Ger. *spiet,* vexation: Dan. *spydig,* sharp, caustic: Gael. *spiod,* malice: Ger. *spitzig,* pointed, satirical: perhaps a mere abbreviation of DESPITE]: sudden or fitful ill-will; hatred or great irritation accompanied with the desire to annoy or injure: V. to treat maliciously; to do with a desire to vex or annoy; to annoy; to thwart. SPI'TING, imp. SPI'TED, pp. SPITE'FUL, a. *-fŭl,* having a desire to annoy or injure; malignant. SPITE'FULLY, ad. *-lĭ.* SPITE FULNESS, n. *-nĕs,* the state or quality of being spiteful; malice. IN SPITE OF [for *in despite of*]: in defiance of; notwithstanding. TO OWE A SPITE, to entertain a grudge against.—SYN. of 'spite, n.': rancor; malevolence; pique; grudge; vexation; chagrin; hatred; malice; malignity.

SPITHEAD, *spĭt'hĕd:* notable roadstead on the s. coast of England, favorite rendezvous of the British navy; 14 m. long by about 4 m. in average breadth; named from the 'Spit,' a sand-bank stretching s. from the English shore for 3 m. S. is the e. division—the Solent (q.v.) being the w division—of the strait which separates the Isle of Wight from the mainland. It is protected from all winds, except those from the s.e., and its noted security caused sailors to give it the appellation the 'king's bedchamber.'

SPITHEAD FORTS.—For these important defenses, £2,000,000 was assigned 1859; embracing in their scope

Portsmouth with its great arsenal and dock-yard Spithead, and the neighboring coast. The plans have been changed from time to time. The foundations of four principal forts were begun 1864: they consisted of rings of stone-work, laid on the levelled bed of the shoal, tapering a little upward from a width of 54 ft. to one of 43 ft.; the outer diameter of the ring gradually lessening from 231 to 213 ft From 20 to 15 ft. of submarine masonry was required. Outside the rings of stone are layers of rubble, to protect the stone-work from tidal action. The forts are in the form of a granite core, surrounded by a great thickness of iron plates. Above each fort are revolving turrets carrying 35-ton guns, which throw shells of 700 lbs. There is also an inner line of forts.

SPITTLE: see SPITAL. SPITTLE-HOUSE, in *OE.*, a house for lepers; a lazar-house.

SPITTLE, SPITTOON: see under SPIT 2.

SPITZBERGEN, *spĭts-bĕrg'ĕn:* group of islands in the Arctic Ocean; lat. 76° 30°—80° 40′ n., long. 9°—22° e.; 300 m. n. of Scandinavia, and 325 e. of Greenland. The group is composed of three large and several small islands; area estimated about 30,000 sq. m. The largest of the group, *Spitzbergen Proper*, consists of two oblong and parallel tracts known as West S. and East S., Stans Foreland, or New Friesland, connected by a neck of land; the whole strongly resembling a boat-hook in shape. The next two in size are *Northeast Land*, and *King Charles Land*—sometimes known as *Egede Land*. Being far within the Arctic circle, and surrounded by a wide expanse of sea, almost the whole surface is covered with perpetual snow and glaciers. The whole w. side is mountainous, its general elevation 3,000—4,500 ft. above sea-level; and the same is true of the n.e. coast. During ten months of the year, mercury freezes, and for the other two months the temperature is seldom more than 5° above the freezing-point; yet, during this short summer, more than 100 species of plants, which constitute the vegetation of this inhospitable region, succeed in springing up, and producing and ripening their seed. The whole of S. could scarcely afford sustenance for a human being; nevertheless it is a haunt of reindeer, foxes, and bears; and whales and seals abound on the coasts. S. has from time to time been occupied by Dutch and Russian colonies, who were supplied from the mainland of Europe. It was discovered, 1596, by William Barentz, the Dutch explorer, in his third voyage to discover the Northeast Passage. It is claimed by Russia.

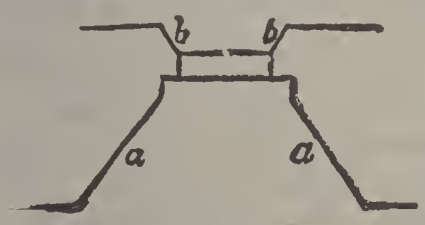
SPITZ-DOG, *spĭts:* small race of the Pomeranian dog (n. Prussia), with pointed nose, erect ears, long hair, and bushy tail. The color is usually white or pale yellowish; rarely black. It has been a favorite pet; but, except sometimes as a watch-dog, it has lost favor on account of its snappishness and its reported liability to hydrophobia. It is mentioned by Darwin as readily crossing with foxes, and is believed to be a cross between the white fox and some of the wolf-dogs semi-domesticated in the arctic regions.

SPLANCHNIC, a. *splăngk'nĭk* [Gr. *splangchnon*, an entrail]: in *anat.*, belonging to the viscera or intestines. SPLANCH'NICA, n. plu. *-nĭ-kă*, medicines for the bowels; diseases affecting the bowels. SPLANCH'NO-, *-nō*, in *anat.*, a prefix, implying relation to viscera, as SPLANCHNO-SKELETON, the osseous structure of particular organs. SPLANCHNOGRAPHY, n. *splăngk-nŏg'ră-fĭ* [Gr. *graphō*, I write]: an anatomical description of the viscera. SPLANCHNOL'OGY, n. *-nŏl'ŏ-jĭ* [Gr. *logos*, discourse]: a description of the viscera; the doctrine of diseases of the internal parts.

SPLASH, n. *splăsh* [Sw. *plaska*, to paddle or dabble. Dan. *pladske*, to splash: Gael. *splaidse*, to fall with a noise, to squash]: water or slush thrown upon anything, particularly from a puddle; a noise, as from water thrown up: V. to bespatter with water or mud, or the like; to strike or dash about water or slush. SPLASH'ING, imp. SPLASHED, pp. *splăsht*. SPLASHY, a. *splăsh'ĭ*, wet and muddy; full of muddy or dirty water. SPLASH-BOARD, a board in front of a vehicle to prevent the mud in wet weather being scattered upon it. SPLASH'ERS, n. plu. *-ĕrz*, guards placed over the wheels of a locomotive engine; the same contrivances placed over the wheels of an ordinary carriage drawn by horses.

SPLATTER, v. *splăt'tĕr:* another spelling of SPLUTTER, which see. SPLITTER-SPLATTER, n. *splĭt'tĕr-splăt'tĕr*, splashy dirt, expressive of the sound made by dashing water. SPLATTERDASHES, or SPATTERDASHES, coverings for the legs to keep off the splashes of mud.

SPLAY, a. *splā* [an abbreviation of DISPLAY]: broad; turned outward: N. in *arch.*, the slanting or bevelled expansion given to the sides of doors or windows; divergence outward from the vertical line: also the corner taken off the outer angle of such openings as at *b*, *b:* V. to slope or slant; to render oblique. SPLAY'ING, imp. SPLAYED, pp. *splād*. SPLAY-FOOT, a foot having the plantar surface flattened instead of concave; flat foot. SPLAY-FOOTED, a. having a splay-foot. SPLAY-MOUTH, a wide mouth; a mouth widened in derision.



Splay.

SPLEEN, n. *splēn* [Gr. and L. *splēn*, the milt or spleen]: the milt; a spongy viscus, related to the lymphatic system, near the large extremity of the stomach, formerly supposed to be the seat of melancholy, anger, or vexation (see below): ill-humor; a fit of anger; latent spite; melancholy: in *OE.*, immoderate merriment; a caprice; instability of temper. SPLEENED, a. *splēnd*, deprived of the spleen. SPLEEN'FUL, a. *-fŭl*, angry; peevish. SPLEEN'ISH, a. *-ĭsh*, affected with spleen. SPLEEN'ISHLY, ad. *-lĭ*. SPLEEN'ISHNESS, n. *-nĕs*, the state of being spleenish. SPLEEN'Y, a. *-ĭ*, angry; peevish. SPLEENWORT, the name of many ferns of the genus *Asplēnĭum* (q.v.).—SYN. of 'spleen': caprice; inconstancy; spite; anger.

SPLEEN: largest and most important of the so-called ductless glands; whose chief object is supposed to be to restore to the circulation any needful substances that may have been withdrawn from it. It is of oblong flattened form, soft, of very brittle consistence, highly vascular, of dark bluish-red color, and situated in the left hypochondriac region, with its interior slightly concave surface embracing the cardiac end of the stomach and the tail of the pancreas (see PANCREAS). It is invested by an external or serous coat, derived from the peritoneum, and an internal fibrous elastic coat. The size and weight of this organ are liable to extreme variations at different periods of life, in different individuals, and in the same individual under different conditions. In the *adult,* in whom it attains its greatest size, it is usually about five inches in length, three or four in breadth, and an inch or an inch and a half in thickness, and weighs about seven ounces. At *birth,* its weight in proportion to that of the entire body is as 1 to 350, which is nearly the same ratio as in the adult; while in *old age* the organ decreases in weight, the ratio being as 1 to 700. The size of the spleen is increased during and after digestion, and is large in highly fed, and small in starved, animals. In intermittent fevers and leucocythemia, it is much enlarged, weighing occasionally 18 to 20 lbs., and constituting what is popularly known as *ague-cake.*

On cutting into the spleen, a section of it shows numerous small fibrous bands termed *trabeculæ,* united at numerous points with one another, and running in all directions. The parenchyma, or proper substance of the spleen, occupies the interspaces of areolar framework, and is a soft pulpy mass of dark reddish-brown color.

The venous blood of the spleen is carried away by the splenic vein, which contributes to form the great portal venous system, distributed through the liver; while arterial blood is supplied by the splenic artery, the largest branch of the cœliac axis. The branches of this artery subdivide and ramify like branches of a tree, with the *Malpighian* or *splenic corpuscles* attached to them like fruit. These splenic corpuscles, discovered by Malpighi, are whitish spherical bodies of lymphoid tissue, being localized thickenings of this same tissue, which forms the external coat of the minute arteries in the spleen. They vary considerably in size and number, their diameter usually ranging from one-third to one-sixth of a line. They may lie to one side of the arteries or may entirely surround them. The blood-vessels ramifying on the surface of a corpuscle consist of the larger branches of the artery with which it is connected, of venous branches, and of a delicate capillary plexus. These splenic corpuscles are much more distinct in early life than subsequently, and are much smaller in man than in most mammals.

As to the uses of the spleen, physiologists are uncertain. It has been believed to be the organ in which red

blood corpuscles are formed; also that in which they are destroyed. It has been suggested that it furnishes an internal secretion by means of which trypsinogen elaborated by the pancreas is transformed into trypsin. Finally, some have thought that the spleen was active in the production of uric acid. The removal of the spleen from the body has frequently been performed in animals without serious effects; but in some of these cases small secondary spleens are developed; and in others, various sets of lymphatic glands are observed to increase rapidly, shortly after the operation, and these probably act vicariously for the spleen.

Diseases of the spleen occur mostly as secondary in the course of other affections; e.g., in malaria, typhoid fever, and leucocythemia, when it is sometimes enlarged to 40 times its natural weight. It is sometimes diminished remarkably in size, the result of the atrophy being unknown, but the apparent result being a loss of color, and a comparatively bloodless condition. The spleen is liable also to the change known as *waxy degeneration.* Rupture of the spleen has occurred in consequence of a blow or of a contusion caused by the fall of a heavy weight or the passing of a wheel over the abdomen. This accident more commonly happens to a spleen enlarged by disease.

SPLENCULUS, n. *splĕn'kū-lŭs,* SPLENCULI, n. plu. *splĕn'kū-lī* [dim. of L. *splēn,* the milt or spleen]: in *anat.,* small detached roundish nodules, occasionally found in the neighborhood of the spleen, and similar to it in substance; supplementary spleens.

SPLENDENT, a. *splĕn'dĕnt* [L. *splendens* or *splenden'tem,* shining; *splendērĕ,* to shine: It. *splendente,* splendid, bright]: shining; glossy; beaming; illustrious.

SPLENDID, a. *splĕn'dĭd* [F. *splendide*—from L. *splendĭdus,* bright, shining—from *splendērĕ,* to shine: It. *splendido*]: very bright; showy; magnificent; glittering; brilliant; heroic; famous. SPLEN'DIDLY, ad. *-lĭ,*

SPLENDOR, n. *splĕn'dĕr* [F. *splendeur*—from L. *splendor,* brightness—from *splendērĕ,* to shine: It. *splendore*]: great brightness; brilliance; magnificent display; grandeur; eminence.—SYN.: brilliancy; lustre; magnificence; showiness; parade; pomp; gorgeousness; display.

SPLENETIC, a. *splē-nĕt'ĭk,* or *splĕn'ĕ-tĭk* [L. *splēnētĭcus,* splenetic—from Gr. and L. *splēn,* the milt or spleen: It. *splenetico,* splenetic]: troubled with spleen; fretful; peevish; gloomy: N. a person affected with spleen. SPLENET'ICAL, a. *-ĭ-kăl,* same as SPLENETIC. SPLENET'ICALLY, ad. *-lĭ.* SPLENIC, a. *splĕn'ĭk* [L. *splēnĭcus*]: belonging to the spleen. SPLENIC FEVER, or SPLENIC APOPLEXY, disease of cattle and sheep, due to a bacillus in the blood; anthrax (see CATTLE-PLAGUE; BACILLUS; GERM-THEORY). SPLENITIS, n. *splē-nī'tĭs,* inflammation of the spleen. SPLENIZATION, n. *splē'nī-zā'shŭn,* a change produced in the lungs by inflammation,

so that they resemble the substance of the spleen. SPLENITIVE, a. *splĕn'ĭ-tĭv*, in *OE.*, passionate; hot; fiery—SYN. of 'splenetic, a.'. peevish; sullen; fretful; gloomy; morose.

SPLENIAL, a. *splē'nĭ-ăl* [L. *splēnĭum*, a patch, a splint]: in *anat.*, applied to a bone of the skull in certain vertebrata; denoting an osseous plate connected with the mandible of fishes, reptiles, etc.

SPLENT. See SPLINT.

SPLICE, v. *splīs* [O. Dut. *splissen;* Sw. *splissa;* Dan. *splidse;* Ger. *splissen*, to join together so that the two ends shall interlace or overlap]: to unite or join together the two ends of a rope by interlacing or twisting together the strands; to connect pieces of wood or metal, as beams or railway-bars, by means of overlapping parts fastened or bolted to them: N. a piece added to a rope by splicing. SPLI'CING, imp. SPLICED, pp. *splīst.* To SPLICE THE MAIN BRACE, in *naval phrase*, to give out an extra allowance of spirits after special exposure to cold or wet. To GET SPLICED, in *common slang*, to get married.

SPLINT, n. *splĭnt*, or SPLENT, n. *splĕnt* [a nasalized form of SPLIT: Dan. *splint*, a splinter: Dut. *splinter*, a splinter]: a small piece split off from a larger; in *surg.*, thin piece of wood used to confine in its proper position a broken bone after being set (see below): hard excrescence growing on the shank-bone of a horse (see below): hard laminated coal, intermediate between cannel and common pit coal: V. to confine or supply with splints. SPLINT'ING. imp. SPLINT'ED, pp. SPLINTS, n. plu. thin strips of wood used for lighting candles, gas, etc. SPLINT ARMOR, a kind of armor consisting of overlapping plates. SPLINT-BONE, the fibula; in some animals, as in the horse, the small metacarpal bones (see SPLINT-BONES). SPLINTER, n. *splĭnt'ėr*, a small piece split off a larger; an irregular fragment rent from a body: V. to shiver; to break or rend into thin small fragments. SPLINT'ERING, imp. SPLINT'ERED, pp. *-ėrd:* ADJ. broken into fragments. SPLINT'ERY, a. *-ėr-ĭ*, consisting of or resembling splinters; having splinters or scales adhering, as in fracture. SPLINTER-BAR, the cross-bar of a coach which supports the springs. SPLINTER-PROOF, capable of resisting the fragments or splinters of bursting shells.

SPLINT, or SPLENT: bony enlargement on a horse's leg, between the knee and fetlock, appearing usually on the inside of one or both forelegs, frequently between the large and small canon bones; resulting from concussion, and most frequent in young horses that have been rattled rapidly along hard roads before their bones are consolidated. When of recent or rapid growth, the splint is hot and tender, and causes lameness, noticeable especially when the horse is trotted on a hard road. A piece of spongiopiline saturated with cold water should be ap-

plied to the splint, kept in position with a light linen bandage, and wetted with cold water or a refrigerant mixture every hour. Perfect rest must be secured for ten days or a fortnight. When the limb is cool, and free from tenderness, the swelling, which will remain, may be greatly reduced by some stimulating applications, e.g., the ointment of the red iodide of mercury, the common fly-blister, or the firing-iron.

SPLINT'-BONES: in the horse and certain allied mammals, the small metacarpal bones. These animals have what is popularly known as an outer and an inner splint-bone in the skeleton of the leg. Beyond the bones of the carpus and tarsus, there is one very large bone (the metacarpal or metatarsal of the third toe), which supports the whole weight of the animal. On either side of this bone are the outer and inner splint-bones, which are small bones, not running more than half the length of the great central bone into which they merge. They represent, in rudimentary form, the metacarpal and metatarsal bones of the fourth and second toe.

SPLINTS, in Surgery: mechanical contrivances for keeping a fractured limb in its proper position, and for preventing motion of the fractured ends; used also for securing perfect immobility of the parts to which they are applied in other cases, as in diseased joints, after resection of joints, etc.

Ordinary splints are of wood or of perforated zinc shaped to the limb, and padded. The splints should be firmly bound to the previously bandaged limb with pieces of bandage, or with straps; care being taken that they are put on sufficiently tight to keep the parts immovable, and to prevent muscular spasm, but not so tight as to induce discomfort or interfere with the circulation. Guttapercha, sole-leather, or pasteboard, after having been softened in boiling water, may in some cases advantageously take the place of wooden or metal splints; they must be applied when soft to the part needing support, so as to take a perfect mold; and must then be dried, stiffened, and, if necessary, lined. Some complicated kinds of splint are required in certain cases.

The splint is now largely superseded by immovable bandages, which consist of the ordinary bandage saturated with a thick mucilage of starch, or with a strong solution of a mixture of powdered gum arabic and precipitated chalk, which, when dry, form a remarkably light but firm support: as, however, these bandages require some hours to dry and become rigid, means must be used to prevent displacement of the limb in the interval. On this account, many prefer the plaster of paris or gypsum bandage, which is applied in the following manner: the limb being protected by a layer of cotton-wool, a bandage of coarse and open material, into which as much dry powdered gypsum as possible has been rubbed, must be immersed in water for about a minute,

and then rolled like an ordinary bandage spirally around the limb: after every second or third turn of the bandage the left hand of the surgeon should be plunged into water, and smeared over the part last applied. When the whole has been thus treated, the exterior of the bandage should be smeared over with a paste of gypsum and water until a smooth surface and complete rigidity have been attained—a process not occupying more than 10 or 15 minutes. Silicate of sodium (so-called liquid glass) may also be used to make a permanent splint in place of gypsum.

SPLIT, v. *splĭt* [Dut. *splijten;* Ger. *spleissen,* to split: Low Ger. *splittern,* to shiver to pieces: Dan. *splitte,* to split]: to divide or separate lengthwise; to rive; to rend; to divide, as into parties; to be thrown into discord, as a party; to burst or part asunder; to be broken as a ship: N. a rent; a crack; a fissure or crack lengthwise; a breach or division in a party. SPLIT'TING, imp.: N. act of one who splits or divides. SPLIT, pt. and pp. *splĭt.* SPLIT'TER, n. *-tėr,* one who splits: V. same as SPLUTTER, which see. SPLIT'TERING, imp. SPLIT'TERED, pp. *-tėrd.* SPLIT-PEAS, peas deprived of their husks and split, used for making soup. SPLITTER-SPLATTER, a phrase imitative of dashing and plashing. TO SPLIT ONE'S SIDES WITH LAUGHTER, to laugh excessively under strong excitement; to burst with laughter. HAIR-SPLITTING: see under HAIR.

SPLUGEN, *splü-ghen:* mountain of the Lepontine Alps, in the Grisons, Switzerland, whose summit, the Tombenhorn, is 9,600 ft. high. The pass of the Splugen, connecting s.e. Switzerland with the region of Italy round Lake Como, is at its highest point 6,940 ft. above sea level, and in its present condition is the work of the Austrian government (1823). The splugen or Italian descent has three great 'galleries'—i.e., covered portions of the pass constructed of solid masonry, for protection from avalanches: they are the longest on any Alpine high-road.

SPLUTTER, v. *splŭt'tėr* [Low Ger. *splittern,* to shiver to pieces: Sw. *splittra,* to shiver: Low Ger. *sprutten,* to spout, to spurt]: to scatter about confusedly and noisily; to scatter about drops of saliva while speaking; to scatter drops about the paper in writing with a bad pen; to speak hastily and confusedly: N. a muddle, as by scattering water; bustle; stir; tumult. SPLUT'TERING, imp. SPLUR'TERED, pp. *-tėrd.*

SPODOMANCY, n. *spŏd'ō-măn'sĭ* [Gr. *spodos,* ashes; *mantei a,* divination]: divination by means of ashes.

SPODUMENE, n. *spŏd'ū-mēn* [Gr. *spodos,* ashes]: a silicate of alumina and lithia of a pale grayish-green color.

SPOFFORD, *spŏf'ėrd,* AINSWORTH RAND, LL.D.: librarian: b. Gilmanton, N. H., 1825, Sep. 12; d. 1908, Aug. 11. He received a classical education; removed to

Cincinnati and engaged in book publishing and selling; was associate editor of the Cincinnati *Daily Commercial* 1859-61; and was then appointed first assistant librarian in the library of congress. He was promoted librarian-in-chief 1864, and held the office until 1897. He received the degree LL.D. from Amherst College 1884. He published several catalogues of the library. The *American Almanac* (annual, 1878-89); *The Library of Choice Literature,* 10 vols. (1881-88); *The Library of Wit and Humor,* 5 vols. (1884); and *A Practical Manual of Parliamentary Rules* (1884).

SPOF'FORD, HARRIET E. (PRESCOTT): author, b. Calais, Me., 1835, Apr. 3. She has spent most of her life in Newburyport, Mass. About 1850 she began writing for Boston story-papers. In 1859 she contributed to the *Atlantic Monthly* the story *In a Cellar,* which gave her reputation, and she has since been a constant writer for the best periodicals. Her style is vivid and imaginative. Her works include *The Amber Gods* (1863); *Azarian* (1864); *New England Legends* (1871); *The Thief in the Night* (1872); *Art Decoration Applied to Furniture* (1881); *Marquis of Carabas* (1882); *Poems* (1882); *Hester Stanley at St. Mark's* (1883); *The Servant-girl Question* (1884); *Ballads About Authors* (1888); *Old Washington* (1906); etc.

SPOHR, *spōr,* LUDWIG, or LOUIS: German musical composer and violinist: 1784, Apr. 25—1859, Oct. 16; b. Brunswick; son of a physician. He began his violin-studies in boyhood; at the age of 12 he played a violin concerto of his own at the court of Brunswick; at 13 he obtained appointment as chamber-musician to the duke. A few years later he made a musical tour through Russia and Germany, giving concerts, and acquiring high reputation as a performer on the violin. In 1804 he became music director at the court of Saxe-Gotha, and held afterward for several years the office of music director of the Theater an der Wien at Vienna. He visited Italy 1817, Paris 1819; and in 1820 appeared in London, where he was received with great applause at the Philharmonic Society's concerts, and produced two symphonies and an overture. In 1823 he became Kapellmeister at the court of Hesse-Cassel, which post he held till 1857, when he retired from professional life. Spohr had a surprisingly fertile imagination. His musical works include eight operas—*Faust, Jessonda, Zemira und Azor, Der Zweikampf der Geliebten, Der Berggeist, Pietro von Albano, Der Alchemist,* and *Die Kreuzfahrer;* three oratorios—*Die letzten Dinge; Des Heilands letzte Stunden,* and *Der Fall Babylons;* various masses, psalms, and hymns, six grand symphonies, four overtures; besides nonettes, quartettes, violin concertos, sonatas for violin and harp; fantasias, and rondos. *Die letzten Dinge,* or Last Judgment, is a grand oratorio. Of his operas, the most esteemed are *Faust* and *Jessonda,* the latter remark-

able for successful embodiment of the spirit of oriental poetry. His songs are deficient in broad and decided melody; but his instrumental works occupy a very high place in the estimation of musicians, especially the C minor symphony, and the symphony known as *Die Weihe der Töne.* As a violinist, S.'s purity of tone and high finish have never been surpassed, and his *Violinschule* is the best and most complete work on violin-playing ever written.—See *The Autobiography of L. Spohr*, translated from the German (Lond. 1864).

SPOIL, n. *spoyl* [F. *spolier*, to plunder—from L. *spoliārĕ*, to deprive of covering, to plunder—from *spolĭum*, the spoil of an animal—that is, its skin stripped off: comp. Gael. *spial*, to pluck, to snatch away]: that which is taken by force, especially in war; pillage; robbery; plunder; the goods plundered; cast-off skin of a serpent: V. to take away by force; to strip of goods; to plunder; to rob; to practice robbery. SPOIL'ING, imp. SPOILED, pp. *spoyld.* SPOIL'ER, n. *-ĕr*, one who spoils or plunders; plunderer; pillager; robber. SPOIL'FUL, a. *-fûl*, in *OE.*, rapacious.

SPOIL, v. *spoyl* [a broad pronunciation of *spill*, to shed liquids, and, hence, to waste: Ger. *spülen;* Sw. *spola*, to wash or rinse]: to waste; to render useless; to mar; to taint; to go to ruin; to decay; to injure character by over-indulgence: N. in *OE.*, corruption; ruin. SPOIL'ING, imp. SPOILED, pp. *spoyld*, or SPOILT, pt. *spoylt:* ADJ. rendered useless; wasted; over-indulged. SPOIL'ER, n. *-ĕr*, one who mars or corrupts. SPOIL'FUL, a. in *OE.*, wasteful. SPOIL-SPORT, one who mars; one who renders useless.

SPOKANE, *spō'kăn:* city, the capital of Spokane co., Wash.; on both sides of the Spokane river; on the Ida. div. of the Northern Pacific railroad, and terminus of the Spokane and Northern, the Seattle Lake Shore and Eastern, and several minor railroads, and of the Oregon Railway and Navigation Company's line; about 270 m. e. of Puget Sound (at Seattle). It is in a rich timber and agricultural country; has a most picturesque location; and derives an enormous and constant water power from the falls (150 ft. in ½ m.) of the river, which never freezes. In its immediate vicinity are highly productive gold, silver, and lead mines, and granite and marble quarries. The city has electric, cable, and steam-motor street railroads aggregating 15 m., and horse railroads extending nearly 25 m.; 15 hotels, 2 col., 20 churches, and 16 public school buildings. There were (1902, Mar.) 4 national banks, (cap. $750,000); 3 state banks; and 1 sav. bank (cap. $50,000); opera-house ($300,000, capacity 1,500 people); 3 theatres (since fire); 2 daily and 5 weekly newspapers; 5 flour mills, 12 saw-mills; 11 iron-foundries, 4 sash and door and 4 furniture factories, all run by water power. The city has the Holly water-works system and electric plants for street railroads and lighting. S. was visited by a fire 1889, Aug. 4, which destroyed property of $14,000,000 estimated value, but proved a local benefit in wiping out the rude wooden buildings common to all

young cities in the west. There is a military post, Fort Spokane. Pop. (1901) 36,848; (1910) 104,402.

SPOKE, n. *spōk* [from SPIKE, which see: Ger. *speiche*; Dut. *speek*, the spoke of a wheel]: one of the bars of a wheel passing from the nave or centre to the felly or rim; the spar or round of a ladder. SPOKE SHAVE, a kind of plane used for dressing curved wood-work. TO PUT A SPOKE IN HIS WHEEL, to impede; to thwart a plan; to hinder any one or do him damage—in allusion to the pin or spoke put into moving wheels of machinery to lock them, or into the wheel of a conveyance to cause it to stop or to slide along.

SPOKE, pt. *spōk*, or SPOKEN, pp. *spō'kn*: from SPEAK, which see. SPOKESMAN, n. *spōks'măn*, one who speaks for one or more persons.

SPOLETO, *spō-lā'tō* (Latin, *Spoletium*): city of central Italy, province of Perugia, on a rocky hill, 61 m. n.e. of Rome. It is commanded by a citadel, on a separate hill, divided from that on which the town stands by a deep gorge, crossed at an immense height by a bridge and aqueduct. The streets are steep, narrow, and dirty. S. has a fine cathedral built in the time of the Lombard dukes, and containing many interesting works of art. The churches of St. Domenico, San Giovanni, the collegiate church of San Pietro, and the palace of the ancient dukes of S., are notable.—The ancient *Spoletium* had its origin in a Roman colony about B.C. 240; and during the second Punic war, Hannibal is said to have been repulsed by the colonists in an assault which he made on the town B.C. 217, after the battle of Trasimene. Under the Lombard dukes, it became cap. of an independent duchy. In 1860, it was taken by the Italians from a body of Irish volunteers in the service of the pope. S. contains many interesting Roman remains, also a ruin which has the name Palace of Theodoric. There are manufactures of woolens and hats. Pop. about 8,000.

SPOLIATE, v. *spō'lĭ-āt* [L. *spolĭātus*, robbed, plundered—from *spolĭārĕ*, to rob (see SPOIL 1)]: to pillage; to plunder; to rob. SPO'LIATING, imp. SPO'LIATED, pp. SPO'LIA'TION, n. *-ā'shŭn*, the act of plundering or robbery. SPO'LIA'TIVE, a. *-tĭv*, tending to deprive or diminish. SPO'LIA'TOR, n. *-tĕr*, one who spoliates. SPO'LIA'TORY, a. *-tĕr-ĭ*, tending to spoil; destructive.

SPONDEE, n. *spŏn'dē* [L. *spondēus*, a spondee: Gr. *spondeĭ'ŏs*, a spondee; as an adj., of or belonging to libations—from *spondai*, a solemn treaty, plu. of *spondē*, a libation, referring to its prolonged solemn character] a poetic foot consisting of two long syllables. SPONDAIC, a. *spŏn-dā'ĭk*, pertaining to a spondee.

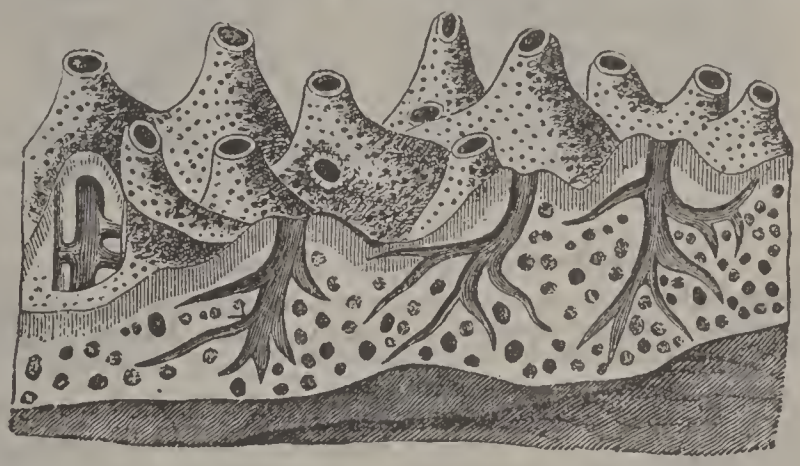
SPON'DIAS: see HOG PLUM.

SPONGE, n. *spŭnj* [OF. *esponge*—from L. *spongia;* Gr. *spongia*, a sponge: F. *éponge*]: porous substance much used for domestic purposes, being the skeleton of simply organized marine animals (see SPONGES): soft porous substance for cleaning and wiping, etc.: one who pertinaciously lives upon others: bakers' dough before it is finally kneaded and shaped to be baked into the loaf: V. to wipe or cleanse with a sponge; to wipe out completely; to imbibe or suck in; to gain by mean arts; to harass by extortion; to hang on others for a maintenance. SPONG'ING, imp.: N. the act of wiping with a sponge, the act of living meanly upon others. SPONGED, pp. *spŭnjd.* SPONGER n. *spŭnj'ĕr*, one who sponges; a hanger-on for maintenance, etc. SPONG'Y, a. *-ĭ*, soft, open, and porous; full of small cavities; having the quality of imbibing moisture readily. SPONG'INESS, n. *-ĭ-nĕs*, state of being soft and porous. SPONG'IFORM, a. *-fawrm* [L. *forma*, shape]: like a sponge; soft and porous. SPONGIDA, n. plu. *spŏnj'ĭ-dă*, the class of animals called sponges. SPONGE-CAKE, a light sweet cake. SPONGING-HOUSE, a prison-officer's house in which debtors committed to his custody were formerly lodged. TO SPONGE ON, to harass by overtaxing hospitality. TO SET A SPONGE, to mix a mass of flour with yeast, and set it in a position favorable for fermenting. TO THROW UP THE SPONGE, to yield the contest; to give up the struggle; a familiar slang phrase derived from the practice of *throwing up* one of the *sponges* that had been employed to wipe the blood from a combatant's face during a prize-fight, in token that he yielded.

SPONGES: organisms, formerly classed with Protozoa, now constituting a sub-kingdom, since it was discovered that they propagate by ova. There are a few small groups in which the skeleton, whether horny, or siliceous, or calcareous, is absent: they are known as *Myxospongiæ* [Gr. *muxa*, mucus]; the other S. are distinguished as *Fibro-spongiæ*, *Calcispongiæ* and *Silicispongiæ* accordingly as their skeleton consists of *spongin*, of limestone, or of silex. But this classification, though it may facilitate a general understanding of the nature and economy of the sponges, is quite inadequate for the purposes of the student of natural history. *Spongin* is a horny substance, in its chemical composition resembling silk. Like the material of the calcareous and siliceous skeleton it sometimes occurs in the form of spicules, but usually it is fibrous (as in the common sponge), consisting of a central core of soft granular substance, around which are concentric layers of spongin, forming a hollow cylinder. There are forms intermediate between the horny, the siliceous, and the calcareous skeleton, on one side, and the myxospongial skeleton on the other, as where the *scleres* or skeletal parts are simply scattered incontinuously through the mesoderm or middle layer of tissue between the ectoderm and the endoderm. In the calcareous and siliceous S., limestone and silex take the place of spongin. The mineral matter occurs in spicules: these are not purely mineral, but contain a trace of organic matter. They are most beautiful microscopic objects; and spicules

of different forms are sometimes found in the same species, sometimes lying close together in bundles, sometimes straight or slightly curved, sometimes in the shape of needles pointed at one end, or at both; sometimes of needles radiating from a centre; while some have a head at one end, like a pin, some have grapnel-like hooks at the ends. Some of the species with horny frame-work have spicules imbedded in it; some have them implanted in the fibres; some are destitute of them. There is a beautiful W. Indian species, *Dictyocalyx pumiceus*, in which the siliceous matter becomes itself a fibrous network, and is so fine and transparent as to resemble spun glass. In a living state, many S. exhibit colors from the presence of coloring matter. The siliceous fibres of the Glass-rope S. of the China seas resemble long white horse-hair. The Venus Flower-basket S. of the same waters is shaped like a cornucopia, and made up of glassy fibres interwoven like a cane chair-seat. Akin to it probably are curious fossils, *Dictyophyton*, of the Chemung group of N. Y., until recently regarded as algæ.

Like any of the higher animals, the body of the sponge is composed of a distinct outer layer of cells, the ectoderm or epidermis, and a ciliated inner layer or endoderm (often

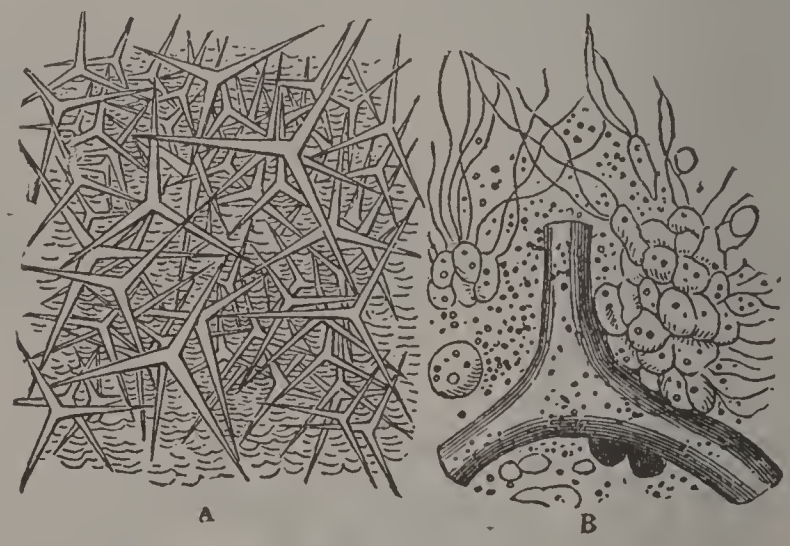


Living Sponge, showing numerous small inhalent terminal, large exhalent orifices.

restricted to definite areas, the so-called 'ciliated chambers'), between which a middle layer of cells, the mesoderm, arises. This may be of very variable thickness, and gives rise to the skeleton. From the close resemblance which the cells of the ectoderm and mesoderm present to *Amœbæ*, and those of the endoderm to those Infusorians known as *Monads*, it was supposed formerly that the sponge is a mere colony of Protozoa. The development of the sponge, however, accords too closely with that of higher animals to admit of such a view, a free-swimming ciliated larva being produced by segmentation of a fertilized ovum; but it is undeniable that in the sponge we have a degree of independence of the cell units far greater than in any other group—a divided sponge readily reunites, and adjacent masses grow together. They assume very various forms, which, as well as the peculiarities in the structure of the

framework, are characteristic of the different branches, classes, sub-classes, orders, families, genera, and species. Some are nearly globular; some cup-shaped, top-shaped, conical, cylindrical, thread-like, etc.; some are simple, and some branched.

The surface of a living sponge is generally covered with minute pores, through which water is imbibed, carrying with it both the air and the organic particles necessary for support of life. The pores are supposed to be permanent in many of the S., and the currents which enter through them to be produced by cilia or flagella. But in those of the very lowest organization, the pores seem formed for the occasion, just as the *Amœba* opens anywhere to admit food within its substance. In *Spongilla fluviatilis*, a small



Structure of *Grantia compressa*:

A, portion showing general arrangement of triradiate spicules and intervening tissue, magnified; B, small portion highly magnified, showing ciliated cells.—From Carpenter *On the Microscope*.

fresh-water species, the opening and closing of each pore occupies less than a minute, and the pores do not open simultaneously, but in irregular succession, and apparently never again in precisely the same spot. No trace of the pore remains for an instant after its closing, nor is there any indication of the point where a new one is to open. The water which enters by the pores passes out of some sponges by a single orifice, which serves for the whole mass; others have numerous orifices (*oscula*) which are permanent, and much larger than the pores by which the water is imbibed, the whole mass being pervaded by canals which lead from the pores to these orifices, from which, under the microscope, a constant discharge of water may be seen taking place, minute opaque particles being carried with its current. These particles are not only fecal matter, but gemmules and ova.

Reproduction takes place by gemmation, by fission, and by true ova. Many of the gemmules go to increase the sponge-mass; but the greater part finally become detached, and are carried out into the water, to settle down in a new locality. The two sexual elements often occur in the same sponge, but even in that case either the male element

or the female is found to predominate. In other sponges the sexes are distinct. The ova develop from wandering amœboid cells, which increase in size, and acquire a store of nourishment. The spermatozoa also are developed from wandering amœboid cells: they are minute bodies with piriform head and vibratile tail.

The sponges employed for domestic and other purposes derive their value from the elasticity and compressibility of their fibrous framework, divested of the glairy substance, and from its power of imbibing fluids. The absence of spicules is essential to a useful sponge. The kinds fit for use are found in the seas of warm climates. Some small species of sponge live at great depths. One has been brought up in the Gulf of Macri from a depth of 185 fathoms.

Fossil remains of sponges are found in many rocks, and of horny, fibrous kinds, as well as of those with calcareous or siliceous framework.

Several species of sponge are in use for economical purposes. The softest and finest in texture is the Turkey or Levant sponge (*Euspongia officinalis*). Two other Mediterranean species are not much inferior—*Hippospongia equina* and *Euspongia Zimocca.* On the shores of the Bahamas and the n. coast of Cuba grow bath-sponges of several kinds, one species not inferior to those from the Levant. A very fine bath-sponge occurs on the shores of Australia, in Torres Strait.

In 1900 the Florida sponge fisheries employed 2,245 persons, with 156 vessels and other apparatus valued at $594,598. The product aggregated 418,125 pounds of all kinds of commercial sponges, which sold for $567,-685. To this total sheep's-wool sponges contributed 181,-311 pounds, valued at $483,263.

The trade in sponge is large; it is carried on chiefly by the Turks and the inhabitants of the Bahama Islands. The number of men employed in the Ottoman sponge-fishery is between 4,000 and 5,000, forming the crews of about 600 boats. These boats find their chief employment on the coasts of Candia, Barbary, and Syria. The sponge is obtained by diving, the diver taking down with him a flat piece of stone of triangular shape, with a hole drilled through one of its corners; to this a cord from the boat is attached, and the diver makes it serve to guide him to particular spots. When he reaches the growing sponges he tears them off the rocks, and places them under his arms; he then pulls at the rope, which gives the signal to his companions in the boat to haul him up. The value of sponges collected in Greece and Turkey is about $500,000 annually. The Greeks of the Morea, instead of diving, obtain sponges by a pronged instrument; but the sponges thus collected are torn, and sell at low price. The best are obtained on detached heads of rock in 8 or 10 fathoms of water. The sponges of the Bahamas and other West Indian islands are of larger size and coarser quality; but large quantities are gath-

ered, and in recent years the industry has yielded about $250,000 annually. The sponges are torn from the rocks by a fork at the end of a long pole. For riddance of the animal matter, they are buried for some days in the sand, and then soaked and washed. In surgery, sponge is of great value, not only for removing blood in operations, but for checking hemorrhage. Burnt sponge was formerly a valued remedy for scrofulous diseases and goitre; but iodine and bromine, from which it derives all its value, are now administered in other forms.

Consult: Lendenfeld, *Monograph of the Horny Sponges* (London, 1889); Haeckel, *Die Kalkschwämma* (Berlin, 1872); Potts, *Freshwater Sponges* (Philadelphia, 1887); Michin, in Lankester's *Treatise on Zoology* Pt. II. (London, 1900); Cobb, *The Sponge Fishery of Florida in 1900*, Report of United States Fish Commission (1903); Moore, *Reports on Sponge Culture* (1903); Wilson, *Sponges of Porto Rico*, Bulletin United States Fish Commission (1900); Rathbun, *Fisheries Industries of the United States* (Washington, 1884).

SPONG'ING-HOUSE, formerly also SPUNGING-HOUSE: in England, usually a sort of tavern, though in Eng. law the private house of a bailiff, who may detain there for 24 hours a debtor arrested for debt, to admit of arrangement by the debtor or his friends to settle the debt. The name is derived from the extortion often practiced there on the debtor.

SPONGIOLES, n. plu. *spŭn'jĭ-ōlz* [L. *spongĭŏla*, dim. of *spongĭa*, a sponge]: in *bot.*, the extremities of roots, composed of loose spongy tissue, through which nourishment is absorbed from the earth: also SPONGIOLETS, n. plu. *spŭnj'ōlĕts*. SPONGITES, n. plu. *spŭn'jīts*, fossils of a structure similar to the sponge.

SPONGIOPILINE, n. *spŭn'jĭ-ō-pī'lĭn* [L. *spongĭa*, a sponge; *pĭlus*, hair]: a useful and efficient substitute for a poultice, consisting of a mass of shreds of wool and sponge with an India-rubber backing.

SPONSAL, a. *spŏn'săl* [L. *sponsālĭs*, belonging to betrothal or espousal—from *sponsus*, promised solemnly; *spondērĕ*, to promise: It. *sponsale*, sponsal]: of or relating to marriage, or to a spouse. SPON'SOR, n. *-sẽr*, one who undertakes to answer for another; a surety; in the Roman Catholic and other prelatical churches, a godfather or godmother at baptism (see GODFATHER AND GODMOTHER): in Baptist, Congregational and Presbyterian churches (and the 'Reformed' churches generally), no such sponsorship is recognized other than that of the parents or guardians. SPONSORIAL, a. *spŏn-sō'rĭ-ăl*, pertaining to a sponsor. SPON'SORSHIP, n. the duty or office of a sponsor.

SPONSION, n. *spŏn'shŭn* [L. *sponsĭō* or *sponsĭōnem*, a solemn promise or engagement—from *spondĕō*, I promise solemnly]: the act of becoming security; a solemn act or engagement on behalf of another.

SPONSON, n. *spŏn'sŭn:* in a *paddle-steamer*, the curve of the timbers toward the outer part of the wing, before and abaft the paddle-boxes.

SPONTANE'ITY, DOCTRINE OF: in mental philosophy, the doctrine that muscular action may and does arise from purely internal causes, and independent of the stimulus of sensations. It had long been the tacit assumption in psychology that we are never moved to action of any kind, except under the stimulation of some feeling, some pleasure or pain, or some end in view. To this is now opposed the doctrine of the Spontaneous beginning of movements under certain circumstances; which, however, does not exclude, but only supplements, the operation of the feelings in stimulating movements, as in the ordinary course of voluntary action. The doctrine supposes that the nerve-centres, after repose and nourishment, acquire a fulness of vital energy, which discharges itself in the play of movement, without any other occasion or motive; the addition of a feeling, or end, enhances and directs the activity, but does not wholly create it.

Of the various evidences and illustrations of S., perhaps the most striking is that furnished by the movements of young animals of the active species. A young dog or kitten shows a degree of activity out of all proportion (it is asserted) to any feeling to be gratified, or any end to be served; we can interpret it only as internal energy seeking vent, irrespective of pursuit of pleasure or avoidance of pain—in other words, irrespective of the action of the will or the organism itself. When the accumulated energy is expended, the animal falls back into repose, and is then roused only by the stimulus of sensation. The state called 'freshness' in a horse, e.g., is a state of superabundant and irrepressible activity. Children go through the same phase: after rest or confinement, they burst forth incontinently into some form of active exitement, of which a part may be considered as pure spontaneity, while part may be owing to sensation. On the other hand, it is suggested that there is lack of certain evidence concerning the ends served or the pleasure involved in the friskiness referred to.

The doctrine of S. is considered suitable to express the difference between the active and the sensitive temperaments; for (it is said) if it were true that action is in proportion to stimulation of the feelings, the most susceptible characters would be the most active; while, in fact, the active temperament is manifested by a profusion of activity for its own sake, and constitutes the restless, bustling, rough-shod, energetic, and enterprising disposition of mind, as seen in sportsmen, soldiers, travellers, etc.—The doctrine is connected with theories of the growth of the Will (q.v.), or voluntary power: see Bain on *The Senses and the Intellect*, 2d ed. 76.

SPONTANEOUS, a. *spŏn-tā'nĕ-ŭs* [L. *spontāněus*, of his own accord—from *spontĕ*, freely or voluntarily: It. *spontaneo:* F. *spontané*]: acting of one's own accord; done without compulsion; acting from its own impulse or energy; happening or produced of itself. SPONTA'NEOUSLY, ad. *-lĭ*. SPONTA'NEOUSNESS, n. *-ŭs-nĕs*, the state or quality of being spontaneous. SPONTANEITY, n. *spŏn'tă-nē'ĭ-tĭ*, quality of acting or proceeding without compulsion or external force; voluntariness.—SYN. of 'spontaneous': voluntary; willing; uncompelled.

SPONTA'NEOUS COMBUS'TION: occasional phenomenon in mineral and organic substances: it consists in a body's producing fire through merely the chemical action of its own elements. The facts connected with spontaneous ignition of *mineral* substances are well known to chemists (see PYROPHORUS). Ordinary charcoal does not undergo combustion in air under a temperature of 1,000°, but in some states it is liable spontaneously to acquire a very high temperature. Thus, lamp-black impregnated with oils, which contain a large proportion of hydrogen, gradually becomes warm, and inflames spontaneously. According to Aubert, Chevallier, and other French observers, recently made charcoal, in a state of fine division, is liable to be spontaneously ignited without the agency of oil. There have been many instances of spontaneous ignition of coals containing iron Pyrites (q.v.), when moistened with water. The pyrites which most readily give rise to S. C. are those in which the protosulphide is associated with the bisulphide of iron. The heaps of shale and refuse coal at the mouths of the pits often take fire spontaneously. Sulphur has no tendency to S. C.; but a mixture of powdered sulphur and iron filings, wetted and covered with earth, becomes in a few hours a kind of small volcano; and carbon-bisulphide vapor has been ignited by solar heat traversing glass. Phosphorus in a dry state has great tendency to ignite spontaneously, and it has been observed to melt and take fire (when touched) in a room in which the temperature was under 70°. The ordinary lucifer-match composition is luminous in the dark, in warm summer nights, which shows that oxidation, and therefore a process of heating, is going on. Hence large quantities of these matches kept in contact may produce a heat sufficient for their ignition. The slacking of quicklime is often attended by development of heat sufficient to set combustible bodies on fire.

As to S. C. in *organic* substances—passing over the accidents from admixture of strong nitric or sulphuric acid with wool, straw, or certain essential oils, we have to consider the cases in which, without contact with any energetic chemical compounds, certain substances—e.g., hay, cotton and woody fibre generally, including tow, flax, hemp, jute, rags, leaves, spent tan, cocoa-nut fibre, straw in manure-heaps, etc.—when stacked in large quantities in a damp state, undergo a process of heating from simple oxidation (eremacausis) or fermentation, and, after a time, may pass into S. C. There is undoubted evidence that

hay and cotton in a damp state will occasionally take fire without external ignition. Cotton impregnated with oil, when collected in large quantity, is especially liable to ignite spontaneously; and the accumulation of cotton-waste, used in wiping lamps and the oiled surfaces of machinery, has occasioned fires, and led to unfounded charges of incendiarism. Dr. Taylor, author of *Medical Jurisprudence*, instances a fire in a shop from a quantity of oil spilled on dry sawdust. According to Chevallier, vegetables boiled in oil furnish a residue liable to spontaneous ignition; and he remarks that all kinds of woolen articles imbued with oil, and collected in a heap, also hemp, tow, and flax, similarly treated, may ignite spontaneously. Dry wood is supposed by Chevallier and some other chemists to have the property of S. C. Some instances are on record of *apparent* S. C. of such organic nitrogenous matters as damp grain or seeds; and in a case recorded in *Annales d'Hygiène* 1841, Chevallier, Ollivier, and Devergie drew the conclusion that a barn had caught fire from S. C. of damp oats stored in it.

For further details on this important subject, see Graham's 'Report on the Cause of the Fire in the *Amazon*,' in *Quarterly Journal of the Chemical Soc.*, V., 34; article 'Combustion' in Watts's *Dictionary of Chemistry*, I; and the elaborate chapter on S. C. in Taylor's *Principles and Practice of Medical Jurisprudence.*

Spontaneous Combustion of the Human Body.—In medico-legal works, cases are recorded, generally of no recent date, in which it was supposed that the body was either spontaneously consumed by inward combustion, or acquired such extraordinary combustible properties as to be consumed when brought into contact with fire. One of the first cases on record rests on the authority of Le Cat, distinguished surgeon of his time, and is stated to have occurred at Rheims 1725. The remains of a woman named Millet were found burned in her kitchen, about 18 inches from the open fire-place. Nothing was left of the body, except parts of the head, of the legs, and of the vertebræ. Suspicion was excited against her husband, and a criminal inquiry was instituted; but learned experts reported that the case was one of S. C., and the prisoner was acquitted. The facts are now explicable on the supposition that the woman's clothes were accidentally ignited In reference to this case, Liebig observes that it is easy to see that the idea of S. C. arose at a time when men entertained entirely false views on the nature of combustion. What takes place in combustion generally has been known only since the time of Lavoisier (1743–94); and the conditions which must combine in order that a body continue to burn, have been known only since the time of Davy (1778–1829). Probably more than 60 supposed cases have been recorded in all. From an analysis of all on record to 1851, Liebig gathers that the great majority agree in the following points: 1. They took place in winter. 2. The victims were brandy-drinkers in a state of intoxication. 3. They occurred where the rooms are heated by fires in

open fireplaces or by pans of glowing charcoal, as in England, France, and Italy: in Germany and Russia, where rooms are heated by closed stoves, cases ascribed to S. C. are exceedingly rare. 4. It is admitted that no one has ever been present during the combustion. 5. None of the physicians who collected the cases, or attempted to explain them, has ever observed the process, or ascertained what preceded the combustion. 6. It is unknown how much time had elapsed from the beginning of combustion to the moment when the consumed body was found.—*Letters on Chemistry*, 3d ed. 1851, 282. Of 45 cases collected by Frank, of Berlin (1843), there are only three in which it is assumed that no fire was near; and Liebig distinctly shows that these three are totally unworthy of belief. The writers who record the other cases assume that the body was ignited by a fire, and then burned like a candle or a bundle of straw, under similar conditions, till nothing but ashes or charcoal was left. Liebig shows the fallacy of their view that excess of fat and the presence of brandy in the body induce abnormal combustibility; and further instances 'the fact that hundreds of fat, well-fed brandy-drinkers do not burn, when by accident or design they come too near a fire.' S. C. in a living body, with the blood in circulation, is (he adds) absolutely impossible. Liebig made thorough investigation of the case of the Countess von Görlitz (1847), who was found dead in her bedroom, with the upper part of her body partly consumed. The physician who was consulted could suggest no other explanation than death by S. C.; but circumstances led to suspicion that she had been murdered by her valet Stauff; and her body was exhumed 14 months afterward. The Hesse Med. College on examination reported that she had not died from S. C.; and the case was then referred to Liebig and Bischoff, whose report was issued 1850, Mar., when Stauff was put on trial. Their conclusion was that the body was wilfully burned *after death*, to conceal the murder (either by strangulation or a blow on the head). The prisoner was convicted, and subsequently confessed that he had committed the murder by strangulation. Since that date, there have been a few supposed cases of S. C. of the human body; but examination by experts has invariably demonstrated the action of extraneous causes.

SPONTA'NEOUS GENERA'TION: see GENERATION, SPONTANEOUS.

SPONTOON, n. *spŏn-tŏn'* [F. *esponton*—from L. *punctum*, a point]: weapon like a halberd, which, prior to 1787, was borne instead of a half-pike by officers of Brit. infantry, as a medium for signaling orders to the regt. The S. planted in the ground commanded a halt; pointed backward or forward, advance or retreat, etc.

SPOOK, n. *spôk* [D. *spook;* Ger. *spuk*]: ghost; a hobgoblin; a spirit; a spectre.

SPOOL, n. *spôl* [Ger. *spule;* Dan. *spole*, a quill, a bobbin: Dut. *spoel*, a quill, a spool]: cane or reed with a knob at each end, or a hollow cylinder of wood surrounded by a ridge at each end, on which thread or yarn is wound: in sewing and lace-making machines, the spools are of metal and in various forms: V. to wind on a spool. SPOOL'ING, imp. SPOOLED, pp. *spôld.*

SPOOM, v. *spôm*, or SPOON, v. *spôn* [from SPUME, which see]: to run before the wind—an old sea-term. To SPOON, in *rowing*, to dip oars so slightly into the water that they ruffle and skim the surface. SPOON-DRIFT [for *spoom-* or *spume-drift*]: the water of billows at sea scattered in a heavy shower of spray by the violence and intensity of the tempest: also SPIN-DRIFT.

SPOON, n. *spôn* [AS. *spón;* Ger. *span;* Icel. *spann;* Sw. *span*, a chip: Dut. *spaan*, a chip, a splint: Gael. *spain*, a spoon; *spann*, to divide, as a liquid, to dash]: a well-known instr. of domestic use, consisting of a handle and a broad hollow at one end; an implement for removing earth, etc., from deep holes; *familiarly*, a simpleton; one foolishly bashful and awkward: V. to be in love. SPOON'ING, imp. SPOONED, pp. *spônd.* SPOONEY, n., or SPOONY, n. *spôn'ĭ*, a half-witted foolish person: ADJ. weak-minded; silly; love-sick. SPOON'FUL, n. *-fûl*, as much as a spoon will hold; a small quantity. SPOON'ILY, ad. *-ĭ-lĭ*, in a weak and foolish manner. SPOON-MEAT, food eaten with a spoon. SPOON-WORM (SIPUNCULOIDEA): see SIPUNCULUS. TO BE BORN WITH A SILVER SPOON IN ONE'S MOUTH, to be born to wealth or good fortune. WOODEN SPOON, in *Cambridge Univ.*, the last on the list of mathematical honors: in general, the least distinguished on a notable list.

SPOONBILL, *spôn'bĭl* (*Platalea*): genus of wading birds of the Heron family (*Ardeidæ*), much resembling storks both in structure and in habits; but distinguished by the remarkable form of the bill, which is long, flat, broad throughout its length, and much dilated in spoon-like form at the tip. The species are not numerous, but widely distributed. The only European species is the WHITE S. (*P. leucorodia*); common in Holland, in marshy districts throughout n. Europe and Asia in summer, and in the salt marshes of the coast of Italy in winter: its range extends also over the whole of Africa. It is gregarious, and the flocks of spoonbills generally make their nests in woods, in the tops of lofty trees. It is considerably smaller than the Common Heron. Its color is white, slightly tinged with pink; bill and legs are black. A curious convolution of the windpipe, in the form of the figure 8, is found on dissection in the adult S., but does not exist in the young. The flesh is said to be tender and of good flavor. The S. is easily tamed.—The ROSEATE S. (*P. ajaja*) is an Amer species; abundant within the tropics, and found in the most s. parts of the United States: it is nearly equal in size to the White S., which it resembles in habits. It is a beautiful bird, with plumage of fine rose-color, of which the tint is deepest on the wings; the tail-coverts crimson.

SPOON-DRIFT. See under SPOOM.

SPOON'ER, JOHN COIT: American legislator: b. Lawrenceburg, Ind., 1843, Jan. 6. He removed with his parents to Madison, Wis., in 1859, was graduated from the University of Wisconsin in 1864, and then enlisted as a private in the Union army. He was mustered out of service as brevet-major, and in 1870 established himself in a law practice at Hudson, Wis. He was elected to the state legislature in 1872, served in the United States senate in 1885-91, and 1897-1907.

SPOOR, n. *spôr* [Dut. *spoor,* a trace, a track]: the track or trail of an animal, especially of one pursued as game.

SPORADES, Greece: the most southerly group in the Ægean Sea, comprising 19 islands lying directly east of the Cyclades, whose antithesis they are—being somewhat scattered—whence the name. The principal islands are: Scio, or Chios, Samos, Cos, Rhodes, Lesbos, and Patmos.

SPORADIC, n. *spō-răd'ĭk* [Gr. *sporadĭkŏs,* dispersed, scattered—from *speirō,* I sow]: scattered. Sporadic cases of disease are those of diseases naturally epidemic, when those diseases occur in only a few scattered cases—so far, opposed to *epidemic* and *endemic.*—Sporadic Languages are those isolated languages which cannot be shown to belong to any known family.

SPORANGIFEROUS, a. *spō'răn-jĭf'ėr-ŭs* [Gr. *spora,* a seed; *anggos,* a vessel; L. *fero,* I bear]: bearing or producing spores. SPORANGIOLES, n. plu. *spō-rănj'ĭ-ōlz,* very minute sporangia.

SPORANGIUM, n. *spō-răn'jĭ-ŭm,* plu. SPORAN'GIA, *-jĭ-ă* [Gr. *spora,* seed; *anggos,* a vessel]: in *bot.,* the immediate case or covering to the spores of some cryptogamic plants.

SPORE, n. *spōr,* or SPORULE, n. *spŏr'ūl* [Gr. *spora,* seed], in Botany: in a sense the *seed* of a cryptogamous plant, as it serves the same purpose of reproduction as the seed of a phanerogamous or flowering plant, and after remaining for a time in a state of rest, is developed into a new plant on occurrence of the necessary conditions. A spore, however, differs very much from the seed of a phanerogamous plant, as it always consists of a single cell, therefore does not contain any *embryo* or rudiment of the future plant. In its formation, it corresponds rather with the grains of pollen in the anther of a flower. Spores are small, often so minute as to be invisible to the naked eye—many of them extremely minute, so that they may be wafted about unperceived; even the spores of the largest ferns are very small. Spores often remain for many years capable of germination; and they seem capable of enduring much drought without destruction. They seem to germinate indifferently from any part of their surface, in which they differ essentially from the seeds of phanerogamous plants. In the parent plant, they

are either scattered singly, or are united in a fruit-like envelope, generally known as a *Sporangium,* or *Sporecase.* In some plants, they are united in definite numbers, as of four (a *tetraspore*), surrounded by an envelope (*perispore,* or *sporidium*). The peculiar reproductive organ, which in some cryptogamous plants produces the spores, is called a *sporocarp,* or *sporophore.* In many plants, e.g., mushrooms, the production of spores belongs exclusively to a part of the plant called the *hymenium.*

SPORESACS, n. plu. *spōr-săks'* [*spore,* and *sac*]: in *zool.,* the simple generative buds of certain hydrozoa, not having the medusoid structure developed.

SPORIDIUM, n. *spō-rĭd'ĭ-ŭm,* SPORIDIA, n. plu. *spō-rĭd'ĭ-ă* [Gr. *spora,* seed; *eidos,* likeness]: in *bot.,* small spores or *conidia,* developed by budding in certain fungi.

SPOROCARP, n. *spōr'ō-kârp* [Gr. *spora,* seed; *karpos,* fruit]: in *bot.,* the sac containing the spores in *Marsilĕācĕæ;* the fruit in *Carposporĕæ.* SPOROPHORE, n. *spōr'-ō-fōr* [Gr. *phorĕō,* I bear]: in *bot.,* the asexual or spore-bearing generation in plants which exhibit so-called alternation of generations.

SPOROZOA: are protozoans which in the adult condition are without flagella or cilia, contractile vacuole and opening for the ingestion of solid food. The class embraces only exclusively parasitic forms, which at some point in their life-cycle produce numerous descendants that are denominated 'spores,' and are usually covered by a firm shell. These spores may be single or manifold, and in special cases the cyst wall may be lacking. The young forms always start the life-cycle as cell-parasites and in all but rare cases alternation of generations appears in the course of the life-history, an asexual type of reproduction (schizogony) alternating with a sexual (sporogony). In most cases also these phases in the life-cycle are found in different hosts. The class was made by Leuckart in 1879 when he brought together the gregarines, *Gregarinida;* the psorosperm sacs of Müller, *Myxosporidia;* the oval or spherical psorosperms of Elmer, *Coccidia,* and Rainey's or Miescher's corpuscles, *Sarcosporidia;* later investigators have added the *Microsporidia, Amœbosporidia,* and *Hæmosporidia.*

The complications which has arisen in the asexual mode of reproduction are great, and a knowledge of the sexual generation is usually necessary for the identification of a species, while upon its character also the major subdivisions of the class are founded. Thus in the Coccidiomorpha the asexual stage is permanently intracellar.

The hæmosporidia pass the asexual cycle of the life-history of the red blood-corpuscles and are the cause of various malarial fevers in man and other animals. The sexual cycle takes place in another host which is regularly a blood-sucking insect. The life-history of the parasite of human malarial fever may serve to illustrate conditions in this group. The parasite first appears as a

minute object in the red corpuscles; it grows rapidly, and ultimately divides into a group of young germs which, with a small mass of residual matter, are set free into the blood plasma by the destruction of the corpuscle. The synchronous release of multitudes of such germs produces the chill characteristic of the disease. These germs infect new corpuscles and continue the cycle until ultimately some such grow into forms which introduce the sexual generation with macrogametes and microgametocytes. These forms await ingestion by a mosquito in the stomach of which microgametes are produced and copulate. The copula penetrates the stomach wall, where there are formed from it myriads of sporozoites that wander into the salivary gland and are injected into a new human host when the mosquito bites, thus beginning again the asexual cycle.

The germs of human malaria are transmitted only by mosquitoes of the genus *Anopheles;* there are, however, at least three species of such malarial germs, giving rise to the three distinct types of malarial fevers known as tertian, quartan and pernicious. Protection from the bite of the mosquito or the destruction of all mosquitoes in a given region will prevent the occurrence of new cases of this disease and ultimately eradicate it as well as elephantiasis, yellow fever and any other diseases transmitted by mosquitoes. In the list of such maladies have been placed dengue, leprosy and tuberculosis, as well as those mentioned above; but the relations of these diseases and the infecting agent have been much less definitely determined than in the three first noted, where the demonstration is positive. See MOSQUITO.

Other disease-producing hæmatozoa, of which the life-history and consequently the relationships are only imperfectly known, but which are probably allied to the group under consideration, are the parasite of the spotted or tick-fever of the Rocky mountains, presumably transmitted by ticks, the parasites of yellow fever and dengue transmitted by mosquitoes, and the parasite of smallpox. Probably the most widely known disease among animals, due to organisms of this group, is Texas fever in cattle, which is transmitted by cattle-ticks. (See RINDERPEST.) Prominent diseases among fishes are produced by the myxosporidia, also included among the sporozoa. No doubt other forms which will have to be included here will be discovered to be the cause of other diseases in man as well as other animals, although some reports of supposed discoveries in the past have been shown to be in error, and the theory of the parasitic origin of cancer and other malignant growths still awaits demonstration.

Chief works on sporozoa: Doflein, F., *Die Protozoen als Krankheitserreger* (Jena, 1901); Lühe, M., *Ergebnisse der neueren Sporozoenforschung* (Jena, 1900; very valuable full bibliography); Wasielewski, von, *Sporozoenkunde* (Jena, 1896); Calkins, G. N., *The Protozoa* (New York, 1901; brief chapter, but good bibliography); Labbé

A., *Sporozoa* in *Das Tierreich* (Berlin, 1899; purely systematic).

SPOR'RAN: a pouch or large purse worn by the Highlanders of Scotland in full dress, and by men of the kilted regiments. It is usually made of the skin of some animal, and often ornamented with silver and stones. It is worn in front of the kilt.

SPORT, n. *spōrt* [OF. *desporter*, to amuse—from L. *dis*, away; *portārĕ*, to carry: It. *diporto*, solace, recreation: Gael. *spors*, diversion, sport]: diversion; anything which makes merry; the mirth or pleasure thus produced; play; game; frolic; mockery; anything driven helplessly about; fowling, hunting, or fishing: V. to divert; to make merry; to frolic; to play; to jest; to trifle; in *familiar language*, to exhibit or wear, as an article of dress. SPORT'ING, imp.: ADJ. practicing the diversions of the field in hunting, fishing, etc.; given to racing, betting, and gambling: N. practice or pursuit of a sportsman. SPORT'ED, pp. SPORT'ER, n. *-ĕr*, one who sports. SPORT'FUL, a. *fûl*, frolicsome; full of jesting; merry; wanton; ludicrous. SPORT'FULLY, ad. *-lĭ*. SPORT'FULNESS, n. *-nĕs*, the state of being sportful; a playful disposition. SPORT'IVE, a. *-ĭv*, inclined to mirth; playful; gay; merry, frolicsome. SPORT'IVELY, ad. *-lĭ*. SPORT'IVENESS, n. *-nĕs*, the state of being sportive; playfulness. SPORT'INGLY, ad. *-lĭ*. SPORTSMAN, n. *spōrts'măn*, one who indulges in the sports of the field; one skilled in hunting, shooting, or fishing, etc. SPORTS'MANSHIP, n. skill in field-sports. IN SPORT, in jest; for play or diversion. TO SPORT ONE'S OAK [perhaps Ger. *pforte*, a door]: in *Eng. universities*, to shut the outer door of one's room.

SPORTS, THE BOOK OF: a popular name for the proclamation issued in 1618 by James I., and ordered to be read in all churches, wherein it was declared that dancing, archery, May-games, morrice-dances, leaping, vaulting, and other such games, were lawful on Sunday after divine service, but prohibiting bear-baiting, bull-baiting, bowling, and interludes. The order to read this declaration was largely disregarded, but in the reign of Charles I. it was republished (1633) and enforced with severity. This created great outcry and opposition, and in 1644 the long parliament ordered all copies of it to be collected and publicly burned.

SPORTS IN PLANTS: a term in biology denoting an individual which differs more or less markedly from the type or parent species; an aberrant form. It is distinguished from 'monstrosity' by its ability to transmit its aberrant character either sexually or asexually to offspring; whereas monstrosities properly so called lack this power, their offspring, if any, reverting to the general type. The origin of sports has furnished much food for speculation, some biologists assuming that aberrations are freaks which nature destroys, while others declare

that the transmutation of species is dependent upon them through the processes of natural selection of the adaptive ones. If the term is to be used as an approximate synonym of monstrosity the first hypothesis is probably true; but if used in its broadest sense the latter is more nearly correct. The matter hinges mainly upon the extent of observation; for, while sports among undomesticated animals are comparatively rare, they are numerous among uncultivated plants, but have been commonly overlooked because biologists have been more awake to the animal than the plant. Each leaf-bud of a plant is capable of producing leaves and branches which differ from those produced by any other bud, and every flower-bud may produce a flower unlike any of its fellows; nay, further, the individual seeds which follow any flower in a single fruit may produce plants unlike one another in many respects and also unlike the parent. But unless these departures are striking enough to attract the attention of the ordinary observer as distinct they are unnoted and hence not calculated upon; hence the popular opinion that sports appear 'suddenly,' since only the remarkable cases are observed.

From a practical standpoint, selection and breeding of sports has long been widely employed. Among domestic animals one of the most striking instances is that of Ancon or otter sheep, the ancestor of which was a long-bodied, crooked-legged freak which was bred to sheep of normal character. Only the individuals which resembled the aberrant parent were used for subsequent breeding. With domesticated plants the practice of breeding from the sports is still more striking, because it can be practiced either sexually or asexually. The initial sport may appear as a seedling or as a 'bud-variation.' In the former case the gardener usually propagates by means of seed, rigorously discarding all specimens that depart unfavorably from the apparent intent of the primal sport, and carefully saving those specimens that approximate or accentuate the characters. If the sport is a bud-variation the gardener usually propagates it by means of cuttings, practicing a careful suppression of individuals which seem to retrogress and selecting desirable ones for further propagation, as in the former case. It may seem expedient to practice asexual methods with a plant produced sexually or *vice versa;* in each case, however, the after-selection is imperative. Some bud-varieties fail to 'come true' even from cuttings, and failure in this respect is common among seed sports. Bud-variation and seed-variation are the same kind since the same means of improvement can be used in each case.

One of the common troubles with sports is self-sterility. This is scarcely important except with fruit trees where, if large blocks of one kind of tree are planted remote from other varieties that blossom at the same time, little or no fruit will be set.

Sports are to be distinguished from reversions in which the individual seems to hark back to the general form of its more or less distant ancestors. They must also be separated from cases of atavism in which the progeny exhibit a character not typical of their race, species or genus but characteristic of an allied ancestral race. Instances of reversion are the loss of the bulbous root of turnips and the 'head' of cabbage which 'run wild'; of atavism, the occasional appearance of several toed horses, whose feet somewhat resemble the three-toed foot of the horse of Tertiary time. See BREEDING; BUD; HEREDITY; HYBRIDITY; NATURAL SELECTION; VARIATION; and consult the authorities cited under them.

SPORULE. See SPORE.

SPOT, n. *spŏt* [Dut. *spatten,* to bespatter or splash; *spat,* a drop of what is splashed: Sw. *spott,* spittle: Dan. *spœtte,* a spot]: a mark; a place discolored; a stain; reproach; blemish; a small extent of place; any particular spot; a small part of a different color from the ground on which it is, as a dress with black *spots;* a dark mark on the sun: V. to make a mark or marks on; to stain; to discolor; to blemish; to disgrace; in *slang,* to take special notice of; to notice; to recognize. SPOT'TING, imp.: N. the putting one's mark upon a person. SPOT'TED, pp.: ADJ. marked with spots. SPOT'LESS, a. *-lĕs,* free from spots; pure; blameless; immaculate; irreproachable. SPOT'LESSNESS, n. *-nĕs,* freedom from spots or stains. SPOT'TEDNESS, n. *-nĕs,* the quality of being spotted. SPOT'TY, a. *-tĭ,* full of spots, or characterized by them. SPOT'TINESS, n. *-nĕs,* state or quality of being spotty. UPON THE SPOT, immediately; before moving. SPOTTED FEVER: see MENINGITIS. SPOTTED LACE, lace on which the pattern consists of small raised marks. TO LIVE UPON THE SPOT, to reside; not to be an absentee.—SYN. of 'spot, n.': speck; flaw; stain; blemish; blot; fault; disgrace; reproach; place; locality; site.

SPOTSWOOD, *spŏts'wûd,* ALEXANDER: 1676-1740, June 7; b. Tangier, Africa: British soldier. He entered the English army at an early age, served under the Duke of Marlborough, was wounded at Blenheim, became deputy quartermaster-general, and was appointed governor of Virginia, reaching his post 1710, June. He held the office till 1723, and did much to strengthen and develop the colony, also to promote William and Mary College. 1730-39 he was deputy postmaster-general of the colonies, and 1740 was appointed major-general to command an expedition to the West Indies, but died while superintending preparations. His *Official Letters* were published by the Virginia Historical Society, 2 vols. (1882-85).

SPOTSWOOD, *spŏts'wûd* (or SPOTISWOOD, or SPOTTISWOOD, *spŏt'ĭs-wûd,*) JOHN, Archbishop of St. Andrews: 1565-1639, Dec. 26; son of John Spotswood, superintendent of Lothion, Scotland. He was educated at the

University of Glasgow, and on his father's death succeeded him as parson of Calder. When James succeeded to the English crown, Spotswood accompanied him on his journey to London, and, soon afterward, on the death of Archbishop James Beaton, was appointed to the see of Glasgow. He was chosen moderator of the general assembly of the Scottish Church, at Glasgow, 1610, and completed the establishment of episcopal government, which James had long labored to accomplish. In 1615, he took a leading and discreditable part in the examination of John Ogilvie, Jesuit priest, who was apprehended at Glasgow, and hanged for refusing to disown the temporal power of the pope. In the same year, he was translated to the see of St. Andrews. As primate of the Scottish Church, Spotswood had now the chief management of ecclesiastical affairs, and great influence also in the civil government, and his rule was marked by uniform ability, and, with a few exceptions, by prudence and moderation. He presided at the general assembly at Perth, 1618, and sanctioned the five points of ecclesiastical discipline known as the Perth Articles. He was as much in favor with Charles I. as with King James, and crowned King Charles at Holyrood, 1633. In 1635, Spotswood was made chancellor of Scotland, a dignity which no ecclesiastic had held since the Reformation, and which brought misfortune to him. He reluctantly entered into the king's unwise measures for introduction of a liturgy into Scotland, and became a chief object of popular dislike when the Covenanters gained ascendency. He soon found it necessary to retire to England. He protested against the lawfulness of the general assembly at Glasgow, 1638, Nov.; and was deposed and excommunicated by that body for alleged immoralities, which, so far as his private character was concerned, were improbable in themselves, and without evidence. He died at London, and was interred in Westminster Abbey.—The writings of Spotswood are his well-known *History of the Church of Scotland,* pub. 1655; a sermon preached at the meeting of the Perth Assembly 1618; and a Latin treatise, *Refutatio Libelli de Regimine Ecclesiæ Scoticanæ,* pub. 1620, in answer to a tract of Calderwood's. See Life ascribed to Bishop Duppa, prefixed to folio editions of his *History;* and Life by Bishop Russell, prefixed to the Spottiswood Society edition of the same work.

SPOTTSYLVA'NIA COURT-HOUSE, BATTLES OF: See WILDERNESS, BATTLES OF THE.

SPOUSE, n. *spowz* [OF. *espouse;* F. *épouse,* a consort —from L. *sponsus,* promised; *spondĕrĕ,* to promise: It. *sposo,* a husband: comp. Gael. *pos,* to wed, to marry]: a married person, husband or wife: V. in *OE.*, to espouse. SPOUSAGE, n. *spowz'āj,* the act of espousing; marriage. SPOUSE'LESS, a. *-lĕs,* destitute of a married partner. SPOUSAL, a. *spowz'ăl,* pertaining to marriage; connubial; nuptial. SPOUS'ALS, n. plu.-*ălz,* marriage; nuptials.

SPOUT, n. *spowt* [Norw. *sputra,* to keep spitting, to spirt: Dut. *spuiten,* to spout; *spuit,* a spout: Sw. *sputa* or *spruta;* Dan. *sprude,* to spout: Gael. *spùt,* a spout]: the projecting mouth of a vessel, by which a liquid may be poured out without spilling; a pipe or conductor of water; a lift or shoot; a water-spout: V. to throw or pour out water forcibly, as from a pipe; to issue with much force; to pour out words with affected grandeur; to speechify, in contempt. SPOUT'ING, imp.: ADJ. throwing or issuing in a stream from a pipe; haranguing or speechifying: N. a speech, in contempt. SPOUT'ED, pp. SPOUT'ER, n. *-ėr,* one who or that which spouts. UP THE SPOUT, in *slang,* in the pawnbroker's, in allusion to the *spout* through which the pledges are sent to the upper store-rooms.

SPRACK, a. *sprăk:* the proper spelling of SPRAG 2, which see: in *OE.,* vigorous; sprightly.

SPRAG, n. *sprăg* [Dan. *sprække,* to crack, to burst: Sw. *spricka,* to split, to sprout: connected with SPRIG, which see]: a young salmon; a rough stout bar of wood: V. to stop a wagon by putting a strong bar of wood between two spokes of a wheel. SPRAG'GING, imp. SPRAGGED, pp. *sprăgd:* ADJ. having the motion arrested by a sprag.

SPRAG, a. *sprăg* [Icel. *sprækr,* brisk, fiery; *sparkr,* lively: Gael. *spraic,* vigor: connected with SPARK]: in *OE.,* quick; lively; active; alert.

SPRAGUE, *sprāg,* HOMER BAXTER, PH.D.: educator: b. Sutton, Mass., 1829, Oct. 19. He graduated from Yale 1852; taught in New Haven; was for three years principal of the Worcester, Mass., high school; and then gave attention to the study and practice of law. He was in the Union army 1861, Dec.—1866, Apr., entering as captain and reaching the rank of colonel; was principal f the State Normal School, New Britain, Conn., 1866-68; also served in the state legislature. He was afterward professor in Cornell University, principal of the Adelphi Academy, Brooklyn, head-master of the girls' high school, Boston, 1876-85; founded the Martha's Vineyard Summer Institute; and 1887 became president of the University of North Dakota, holding this position until 1891, when he resigned to engage in literary and philanthropic works. He has published: *Fellowship of Slave-Holders* (1857); *Alleged Law Blunders in Shakespeare* (1900); *The Right and Wrong of Our Civil War* (1903); etc.

SPRAGUE, *sprāg,* WILLIAM BUELL, S.T.D., LL.D.: 1795, Oct. 16—1876, May 7; b. Andover, Conn.: Presbyterian clergyman and author. After graduation at Yale 1815, and two years of teaching, he studied theology at Princeton, was pastor of the First Church (Congl.) of West Springfield, Mass., 1819-29, and of the Second Presbyterian Church of Albany, N. Y., 1829-69, removing thence to Flushing, L. I., where he died. He was noted in his profession, and also as a collector of auto-

graphs (100,000), and of pamphlets, giving the latter and valuable manuscripts to the New York state library, and to Harvard a collection of the papers of Gen. Gage. Besides very many sermons and other occasional productions, he published *Letters to a Daughter* (1827); three vols. addressed to young men (1830, 44, 48); *Letters from Europe* (1828); *Lectures on Revivals* (1832); *Lectures on the Contrast Between True Christianity and Other Systems* (1837); life of Dr. Griffin (1838); *Aids to Early Religion* (1847); *Women of the Bible* (1850); and *Annals of the American Pulpit*, 9 vols. (1857-69), the last a work of great research and high authority.

SPRAIN, n. *sprān* [OF. *espreindre*, to press, to strain —from L. *esprimĕrĕ*, to squeeze out—from *ex*, out; *premĕrĕ*, to press]: excessive strain of the muscles or ligaments of a joint, causing much pain: V. to overstrain the ligaments of a joint without dislocation. SPRAIN'ING, imp. SPRAINED, pp. *sprānd.*—*Sprain*, or *Strain*, is a term in surgery, designating a violent stretching of tendinous or ligamentous parts with or without rupture of some of their fibres. Sprains are easily induced in all the joints of the upper limbs, especially in the wrist and the articulations of the thumb. In the lower extremity, the ankle is the joint by far the most frequently affected; this is accounted for anatomically by the small size of the articular surfaces, the great weight which the astragalus (the bone presenting the lower articular surface) has to support, and the unyielding nature of the lateral ligaments. In slight sprains of this joint, the ligaments are only stretched or slightly lacerated; in severe cases they may be completely torn through. Sprains of the ankle are sometimes mistaken for fractures, and *vice versâ;* and the two injuries may coexist. The pain and swelling sometimes make an accurate diagnosis difficult, especially if the patient is not professionally examined for some time after the accident; and if any doubt exists, the case should be treated as for the more severe injury. Sprains of the knee are not rare, and are characterized by great swelling from effusion of fluid within the joint. Sprains of the back are frequent, and are among the most serious of any; but in most cases it may be anticipated that after confinement in bed or on a sofa for two or three weeks, and with proper treatment, the patient will be able to walk, though he may feel stiffness and pain for several weeks longer. The treatment of sprains generally must be regulated by their severity. In a severe sprain, with much pain and inflammation, leeches should be applied, followed by hot-water fomentations, or application of hot linseed-meal poultice. In slighter cases, rest and cold lotions are sufficient treatment. In all cases of sprain of the extremities, thin pasteboard splints placed on the outer and inner surfaces of the joint, over a wet bandage previously laid round it, afford support to the part, and comfort to the patient. In sprains of the back, more decided antiphlogistic measures are needed.

SPRAINS, or STRAINS, are very common among horses, owing to the severe exertions required of them, often while young. Various muscles, ligaments, and tendons are liable to strain, but none more frequently than the large tendons passing down the back of the fore-limbs. In slight cases, cold water continuously applied for several hours gives relief: but in all serious cases, diligent fomentation with water about the temperature of 100° is preferable; or the injured part may be swathed in a thick woolen rug, kept constantly moist and warm by frequent wetting with the hot water. Perfect rest is essential; and, to insure relaxation of the large tendons of the horse's limbs, he may in bad cases be kept slung for several days. Blisters, hot oils, firing, and all such irritants, are on no account to be used until the inflammation abates, and the part becomes cool, and free from tenderness. Such remedies may then be useful for causing reabsorption of swelling, perhaps also for invigorating the weakened part.

SPRANG: pt. of SPRING, which see.

SPRAT, n. *sprăt* [Dut. *sprot*, a young animal, a sprout: Gael. *sprott*, a sprat], (*Harengula sprattus*, formerly *Clupea sprattus*): fish of the herring family (*Clupeidæ*), very abundant on many parts of the British coast, and elsewhere in the n. Atlantic. It is smaller than the herring, being only about six inches in length when full grown; but much resembles it, though easily distinguished by the serrated belly, and by the position of the fins, the ventral fins beginning immediately beneath the first ray of the dorsal fin, and not beneath the middle of it, as in the herring and pilchard. Notwithstanding many differences, an old opinion has recently been revived, that the S. is the young of the herring, which, therefore, it is injurious to a more important fishery to capture. For this theory sufficient evidence has not yet been adduced. Drift-net fishing is practiced as for herring; also *stow-boat* fishing, with a large bag-net suspended between two horizontal beams beneath the boat, and about a fathom from the bottom of the water. Vast quantities of sprats are taken in Britain, so that they are used as manure by farmers; while their cheapness makes them a favorite food of the poorer classes. In Scotland they are called *garvies*. Notwithstanding its cheapness, the S. is a very fine fish, of flavor quite equal to the herring, though decidedly different. Dried sprats are a very common article of provision, and sprats are also sometimes salted. The *kilkies* brought from Riga and other ports on the Baltic are sprats cured with spices; and many of the boxes of *Sardines* from the w. coast of France, are filled really with sprats.—Very closely allied to the S. is *Harengula latulus*, the *Blanquette* of the French, caught in great abundance on parts of the w. coast of France.—Other species of *Harengula* are found in other seas: one (*H. humeralis*), which abounds in the W. Indies, and s. as far as Rio Janeiro, is much esteemed, but becomes poisonous at certain seasons, from some unknown cause.

SPRAWL, v. *sprawl* [Sw. *spraitla;* Dan. *sprælle,* to toss about the limbs: Dut. *spartelen,* to frisk, to wag one's legs: Icel. *sprökla,* to throw about the limbs]: to stretch the body and limbs wildly and carelessly while lying; to lie with the limbs stretched out or struggling; in *OE.,* to struggle as in the convulsions of death. SPRAWL'ING, imp.: ADJ. tumbling with agitation or contortion of the limbs. SPRAWLED, pp. *sprawld.*

SPRAY, n. *sprā* [It. *sprazzare,* to shower down, as water upon stones: Ger. *spritzen,* to spatter: Sw. *spratta,* to scatter: OHG. *sprad,* a bush: Gael. *spreigh,* to scatter, to burst open]: a small shoot or branch of a tree, or a collection of them; a twig; scattered drops of water dashed or blown into the air.

SPREAD, v. *sprĕd* [Dut. *spreiden;* Ger. *spreiten;* Sw. *sprida;* Dan. *sprede,* to spread, to scatter: comp. Gael. *spreigh,* to scatter, to branch]: to stretch or expand to a broader surface; to overlay one substance with another; to extend; to cover; to expand itself in all directions; to be extended or stretched; to overlay; to emit; to circulate, as news or fame; to propagate, as disease; to unfurl, as sails; to cause to be extensively known; to diffuse; to scatter over a surface; to fill or cover a wider space: N. extent; compass. SPREAD'ING, imp.: ADJ., extending over a large space; wide: N. act of extending or expanding. SPREAD, pt. and pp. SPREAD'ER, n. *-ĕr,* he who or that which spreads; a divulger; a disseminator. —SYN. of 'spread, v.': to disperse; distribute; scatter; disseminate; diffuse; circulate; propagate; publish; sprinkle; expand; stretch.

SPREAD EAGLE: see EAGLE.

SPREE, n. *sprē* [Icel. *sprækr,* brisk, fiery: Gael. *spraic,* vigor, exertion: comp. F. *esprit,* spirit, vivacity]: *familiarly,* a merry frolic; a wild ebullition of spirits, especially in a disorderly and thoughtless indulgence in liquors.

SPREE, *sprā:* river of Prussia, rising near Ebersbach in e. Saxony, on the borders of Bohemia, and after an irregularly winding, but generally n. and n.w. course of 200 m. flowing into the Havel (q.v.) at Spandau. It flows through a low and marshy region; abounds in fish, and frequently expands into lakes, the largest of which are the *Schwieloehsee* and *Müggelssee.* Its banks are flat, sometimes sandy and wooded, sometimes rich in meadow-pastures. It becomes navigable for small craft at Kosenblatt. The principal towns past or through which it flows are Bautzen, Spremberg, Kottbus, Lübben, Beeskow, and Berlin. Its trade is considerable. By the Friedrich Wilhelm's or Müllrose canal, it is connected with the Oder.

SPRENG'EL EXPLO'SIVES: see EXPLOSIVES.

SPRIG, n. *sprĭg* [As. *spree;* Icel. *sprek,* a twig or stick: W. *brigyn,* a twig, a shoot of a tree]: a small shoot or twig; offspring; a scion, generally in contempt, as a *sprig* of nobility; a small nail without a head: V. to mark or adorn with sprigs; to work or strengthen with sprigs. SPRIG'GING, imp. SPRIGGED, pp. *sprĭgd.* SPRIGGY, a. *sprĭg'gĭ,* full of sprigs.

SPRIGHT, n., or SPRITE, n. *sprīt* [corrupted from SPIRIT, which see]: in *OE.*, a spirit; a shade; incorporeal agent; apparition: V in *OE.*, to haunt as a sprite. SPRIGHT'ING, imp. SPRIGHT'ED, pp. SPRIGHT'FUL, a. in *OE.*, lively; gay; vigorous. SPRIGHT'LESS, a. in *OE.*, spiritless; dull; sluggish. SPRIGHT'LY, a. *-lĭ*, spirit like; brisk, lively; animated; full of life and activity. SPRIGHT'LINESS, n. *-lĭ-nĕs*, the quality of being sprightly; liveliness-briskness.

SPRING, n. *sprĭng* [Sw. *springa*, to burst, to spring forth: Ger. *springen;* Dan. *springe*, to spring: Sw. *spraka;* Dan. *sprage*, to crackle]: a leap; a bound; elastic power or force; the start, as of a plank; an elastic body, as a steel rod, a coil of wire, India-rubber, etc., used for various mechanical purposes (see SPRINGS, MECHANICAL): source; fountain of water (see below); rise; beginning: season when plants begin to vegetate and grow—one of the four seasons of the year: lower part of an Arch (q.v.): V. to appear suddenly; to cause to explode, as a mine; to burst; to bound or leap; to pass by leaping; to proceed or issue, as from a source or ancestors; to begin to grow out of the ground; to germinate; to come into existence; to open, as a leak; to begin to appear or exist; to arise, as the day; to proceed, as from a cause; to move by elastic force. SPRING'ER, n. *-ĕr*, a dog for setting up game, allied to the spaniel and the setter (see below): a young plant. SPRING'ING, imp.: ADJ. gushing from, as a spring: N. the act or process of leaping, issuing, or proceeding; growth; in *arch.*, the first course of stones of the arch resting on the side walls. SPRANG, pt. *sprăng*. SPRUNG, pt. pp. *sprŭng*, arisen. SPRINGY, a. *sprĭng'ĭ*, having great elastic force or power; having the power of restoring itself after being bent; spongy; abounding with springs. SPRING'INESS, n. *-ĭ-nĕs*, the power of springing; elasticity; power of restoring itself after being bent. SPRING'ER, n. *-ĕr*, one who or that which springs: the point at which an arch unites with its support (see ARCH). SPRING-BOARD, an elastic board secured at the ends, used in performing feats of agility, or for exercise. SPRING'BOK, or -BOC, n. *-bŏk* [Dut. *springbok*—from *springen*, to spring, and *bok*, a he-goat]: a species of antelope. SPRING-GUN, a firearm discharged by a spring when trodden upon. SPRING-HEAD, fountain or source. SPRING-TIDES, the high tides which occur about the time of new and full moon. SPRINGTIME, the season of spring. SPRING-WHEAT, species of wheat sown in spring. INTERMITTENT SPRINGS, springs whose waters generally come with an alternate rush and a pause. MINERAL SPRINGS, outflows of water from the ground, which are impregnated with various mineral substances (see MINERAL WATERS, NATURAL). OIL-SPRINGS, outflows of oil from large natural deposits in the bowels of the earth, arising from organic matter, either vegetable or animal (see PETROLEUM). TO SPRING A FENCE, to leap a fence. TO SPRING A LEAK, in a *ship*, to open in the seams of the planking to the extent of becoming leaky. TO SPRING A MAST, said of a mast when it is bent or strained, or started

from its fastenings. To SPRING A MINE, to cause it to explode. To SPRING A RATTLE, to put a rattle in motion. To SPRING AT, to leap toward. To SPRING FORTH, to leap out; to rush out. To SPRING IN, to enter with a leap, or in haste. To SPRING UPON, to rush on with haste or violence; to assault.—SYN. of 'spring, v.': to bound; leap; jump; arise; proceed; issue; appear; grow; thrive; start; shoot; discharge.

SPRING, n. *spring* [comp. Gael. *spruan*, brushwood]: in *OE.*, a plant; a young tree; a coppice; a grove.

SPRING: stream of water issuing from the earth. The source of springs is the rain and snow that fall from the clouds. Very little of the water precipitated in any district finds its way immediately by rivers to the sea; the great proportion is either evaporated from the surface of the earth, and, reabsorbed by the atmosphere, is taken into use by plants and animals, or sinks into the earth. All loose soils and gravels greedily absorb water, which descends until it meets with a stratum through which it cannot penetrate. A pit dug into the water-charged soil would speedily fill itself by draining the water from the soil. All rocks contain water; some retain it by capillary attraction, like a sponge; others hold it merely mechanically, and easily part with it. Chalk will absorb and retain one-third of its bulk of water; sand, while it will absorb as much, will part with nearly the whole amount to a well dug in it. Argillaceous deposits and compact rocks are barriers to the passage of water, and cause the superincumbent pervious strata to become water-logged, where there is no outlet. Sometimes the edges of the strata are exposed on the sides of a valley, and permit free escape of the contained water, which pours from them over the neighboring land. But rents and fissures, as well as inequalities on the surface of the impervious beds, give the water a circumscribed course, and cause it to issue in springs.

The water, as it percolates through the earth, always becomes more or less charged with foreign matter, owing to its solvent property. Carbonate, sulphate, and muriate of lime, muriate of soda, and iron, are the most common impurities in spring-waters; magnesia and silica also frequently occur. These substances, from evaporation of part of the water, or escape of the carbonic acid gas, by which so large a quantity is often held in solution, are frequently deposited on the margins of the springs, or in the courses of the streams flowing from them. Such deposits are found in all so-called petrifying springs; and the hot wells of Iceland and the Azores are surrounded with basins formed of silicious sinter derived from the water. When the foreign ingredients have medicinal qualities, the springs are known as Mineral Waters (q.v.).

Springs are either associated with the superficial strata, or rise from considerable depth. *Surface-springs* occur where the absorbent surface-deposits rest on an impervious bed, which prevents further downward progress of the water, or where the beds through which the water flows

are near the surface, as in fig. 1, where C and E are impervious clay-beds, and D is a bed of sand or gravel, which in the upper portion is exposed on the surface, or is overlaid by only loose soil, and after being covered for some distance by the clay-bed C, makes its appearance again at B, where the valley cuts it through here the water collected over the area, A, is discharged Surface-springs, depending so directly on rain for supplies, are very variable in the amount of water that they deliver. They frequently fail entirely in the summer, and always after great droughts. Their temperature varies with that of the district, being warm in summer, and cold in winter, as they do not penetrate below that plane in the earth's crust which is affected by the seasonal changes in temperature.

When the bed which forms the reservoir for a spring is at such distance from the surface as to be beyond the zone of season changes, yet within the zone influenced by the climate, the water has a temperature equal to the mean temperature of the locality where it springs. Such springs

Fig. 1.

have generally a large area for collection of the superficial water, and are consequently regular in the quantity of water that they deliver. They are brought to the surface by means of faults (see FAULT: DISLOCATION, in Geology).

Most deep wells have a lower origin than the zone of climate temperature, which in the United States reaches the depth of 60—80 ft. It is well known that a regular increase in the temperature is observed after this zone is passed, equal to 1° of F. for every 55 ft. As wells have a temperature corresponding to that of the strata from which they spring, it follows that the deeper the spring (below the zone of climate temperature) the higher will be its temperature. Local conditions may affect the thermal state of springs, as in the Geysers in the active volcanic district in Iceland, and the warm springs near Naples; but where no such local influences exist, the depth of the bed whence the water comes may be to some extent estimated by its temperature. Thermal springs occur in Britain at Matlock (66° F.) and Buxton (82°) in Derbyshire, at Bath (117°) in Somerset, and at Clifton (76°) in Gloucestershire. For thermal springs in the United States, see MINERAL WATERS, NATURAL. Artificial communications have been opened with deep-lying strata, by which the water there contained has been brought to the surface, and in these the temperature is found to increase in proportion to the depth of the bore: see ARTESIAN WELLS. The

most remarkable thermal springs are the Geysers of Iceland: see GEYSER.

Intermittent springs are produced sometimes by the ebb and flow of the tide, as at Richmond near London, where the rise at high water is seen in the wells which flow from the arenaceous strata on the banks of the Thames; and sometimes they depend on supply from rain. But there is a kind of spring whose intermittence is believed due to the structure of the internal cavities from which the supply is obtained (see fig. 2). The large reservoir, A, is fed by the rain percolating through the rock: it communicates with the surface by a siphon shaped tube, BCD. As long as the water in the reservoir is at a lower level than the arch of the siphon at C, no water can escape (see SIPHON); but

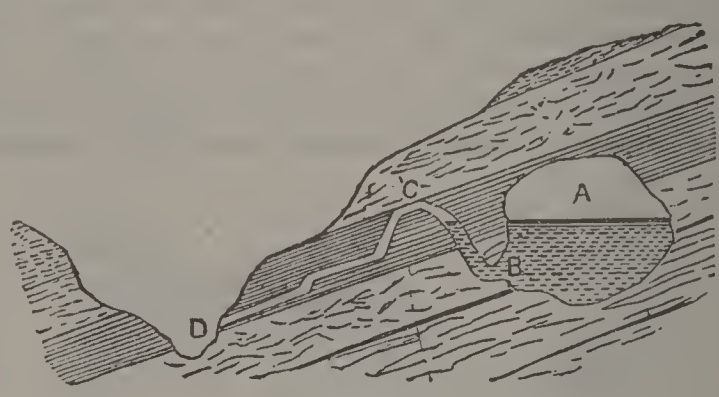


Fig. 2.

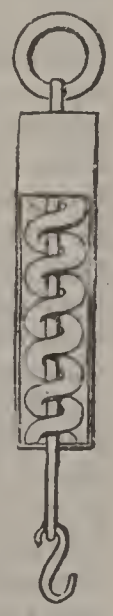
as soon as it reaches its level, the whole of the water in the cavity will be drawn off, the spring will then cease, and will reappear only when sufficient water has accumulated to permit the siphon again to act.

SPRING, *spring*, GARDINER, D.D., LL.D.: Presbyterian clergyman: 1785, Feb. 24—1873, Aug. 18; b. Newburyport, Mass.; son of Samuel S., D.D. He graduated at Yale 1805; studied law in New Haven and was admitted to the bar 1808; studied theol. at Andover Seminary; and 1810, Aug. 10, was ordained pastor of the Brick Presb Church in New York, where he remained till his death, though offered the presidency of Hamilton and Dartmouth Colleges. His influence as preacher and pastor was very great. In 1816 he promoted the formation of the Amer. Bible Soc.; 1825 of the Amer Tract Soc,; and 1826 of the Amer. Home Missionary Soc. His publications were numerous, and included *Essays on the Distinguishing Traits of Christian Character* (1813); *Fragments from the Study of a Pastor* (1838); *Obligations of the World to the Bible* (1841); *The Bible Not of Man* (1847); *The Power of the Pulpit* (1848); *The Mercy Seat* (1849); *Contrast between Good and Bad Men*, 2 vols. (1855); *Pulpit Ministrations*, 2 vols. (1864); and *Personal Reminiscences of the Life and Times of Gardiner Spring*, 2 vols. (1866).

SPRING, SAMUEL, D.D.: 1746, Mar. 10—1819, Mar. 4; b. Northbridge, Mass.: Congl. minister. He graduated at the College of N. J. 1771; studied theol., and was licensed to preach 1774; was chaplain in Arnold's expedition to Canada 1775 and in the revolutionary army 1776; and 1777, Aug. 6, was ordained pastor of the Second Congl. Church in Newburyport, Mass., where he remained till his death. He aided in organizing the Andover Theol. Seminary, the Mass. Missionary Soc., and the Amer. Board of Commissioners for Foreign Missions; was a leader of the Hopkinsians in theology (see HOPKINS, SAMUEL); edited *The Massachusetts Missionary Magazine;* and published many sermons and controversial works.

SPRINGAL, n. *spring'ăl* [from SPRING 1]: in *OE.*, a youth; a nimble young man; an anc. military engine for throwing stones and arrows.

SPRING'-BALANCE; apparatus for measuring weight or force by the elasticity of a spring of steel. It consists of a spring in a cylindrical coil, through which passes freely a graduated bar, having a hook attached to its under end, and a plate to its upper (fig.). The spring is inclosed in an oblong or cylindrical box, quite closed except at the bottom, where there is a hole just large enough to allow the free passage up and down of the graduated bar. When the instrument is to be used, it is suspended by a ring fastened to the upper part of the box; the weight to be estimated is then hung on the hook, and pulls down the rod, the button or plate at the top of which compresses the helical spring within against the bottom of the box; and the graduation corresponding to this amount of compression of the spring, is read off at that part of the rod which just shows itself outside. In another form of the spring-balance (Salter's Balance) a brass index-plate is attached to the side of the box, and a vertical slit through both plate and box is made from top to bottom; the weight is in this case read off on the plate by a pointer fastened to the spring, and protruding through the slit. In a third form (Martin's index weighing-machine) the interior rod, instead of being graduated, is furnished with a rack on one side: this rack moves a toothed-wheel fastened on the side of the instrument; and this wheel has at one extremity of its axis a long index, which, on the wheel being put in motion, traverses a circular dial-plate, on which the graduations of weight are marked. The advantage of this last construction consists in the arrangement of the size of the toothed-wheel to that of the dial-plate, so that, since the toothed-wheel and index make a complete revolution simultaneously, a small motion of the former may produce a large motion of the latter, and the weight of the body be much more accurately indicated than can be done directly on the graduated rod. Also, there is a form of S.-B. in which the spring has a C-shape. The upper end is suspended by a ring, and the weight is suspended from the lower end. As the bowed



Spring-balance.

spring opens, a pointer traverses a graduated arc, registering the weight. The S.-B. has one advantage over the ordinary balance, that it does not estimate unknown weight by that which is known; and is applicable therefore to determination of 'absolute' weight in all latitudes, at the equator as well as at the poles; but it has the great disadvantage of being considerably affected by change of temperature, the force of the spring to resist compression being diminished as the temperature increases at the rate of about $\frac{1}{5000}$ for each degree of Fahrenheit; consequently the apparent weights of bodies must be corrected in this proportion. The S.-B. is called also a 'dynamometer,' from its use to indicate the intensity of the forces exerted by animals or machines; for this purpose, it is attached between the force and its object, the force being applied to its object solely through the medium of the dynamometer.

SPRINGBOK, *spring'bŏk* (*Antilope euchore*, or *Antidorcas euchore*): species of antelope, nearly allied to the gazelles, abundant in s. Africa. It is an extremely beautiful creature, of graceful form, and fine colors. It is larger than the roebuck, and its neck and limbs much longer and more delicate. The general color is fulvous brown on upper parts, pure white beneath, the colors separated on the flanks by a broad band of deep vinous red. The whole head is white, except a broad brown band on each side from the eye to the mouth, and a brown spot in the centre of the face. Two curious folds of skin ascend from the root of the tail, and terminate near the middle of the back; they are usually closed, but open out when the animal is bounding, and disclose a large triangular white space otherwise concealed. The S. derives its name from its prodigious leaps either when alarmed or in play, often to the height of 7 ft., sometimes 12 or 13 ft. Its ordinary abode is in the *karroos* or arid sandy plains; but when all pasture there is scorched, immense herds congregate, and migrate to more fertile regions, often devastating the fields of the colonists. Pringle speaks of seeing the country near the Little Fish river specked with them as far as the eye could reach, and estimates the number in sight at once as not less than 25,000 or 30,000. Capt. Cumming describes a still more extraordinary scene, a vast herd pouring through an opening among hills, in one living mass, half a mile in breadth, and so continuing for hours together. So dense are these herds sometimes in their migrations, that the lion or the leopard, which ordinarily hangs on their skirts with a view to prey, is taken prisoner, and compelled to march along in the mass. The strongest animals are generally foremost, but when satiated with food, they fall behind, and others, hungry and active, take their place. When taken young, the S. is easily tamed, and becomes very familiar, troublesome, and tricky.

SPRINGE, n. *sprĭnj* [from Eng. *spring;* Dut. *spring-net*, a noose or net]: a noose to catch birds and game with; a spring-noose; a snare: V. to catch in a springe; to ensnare. SPRINGE'ING, imp. SPRINGED, pp. *sprĭnjd.*

SPRINGFIELD, *spring'fēld:* city, cap. of Sangamon co. and of the state of Ill.; on the Chicago and Alton, the Illinois Central, the Chicago, Pittsburg and St. Louis, the Wabash, the Cincinnati, Hamilton and Dayton, and the Baltimore and Ohio railroads; 4 m. s. of the Sangamon river, 95 m. n.e. of St. Louis, 185 m. s.w. of Chicago; 4 sq. m.; locally known as the 'Flower City.' It is in a grain-growing and general agricultural region, with valuable bituminous coal mines in its suburbs; is on a strip of beautiful prairie; is laid out in broad straight streets; and derives its name of 'Flower City' from the abundance of ornamental trees, shrubs, and flowering plants. In the centre of a large and beautiful park is one of the most ornate and costly capitol buildings in the United States; extreme length 379 ft.; extreme depth 286 ft., height of dome 320 ft., height of lantern on dome 24 ft., total cost $5,000,000. Other notable buildings are the U. S. court-house and post-office; city hall; state arsenal; co. court-house; high school; public library; hospitals; Bettie Stuart Institute; and numerous churches. There are about 48 churches. The net public debt (1905) was $881,000; assessed val. of all taxable prop. $7,312,188; tax-rate $7.24 on $100. There were 5 nat. banks (cap. $1,450,000); 1 state bank (cap. $300,000); and 1 trust company (cap. $100,000). The manufactories included carriage and wagon factories, iron-foundries, planing-mills, a watch-factory which employs 2,000 hands, and sev. other minor industries. Establishments 320; cap. $5,030,438; val. products $6,612,286. In 1901 there were 10,214 children of school age (6-21 years), 5,816 were enrolled in pub. schools and 1,500 in priv. and parochial schools. There were 16 public school buildings and 1 high school; and 151 teachers. The principal institutions for superior instruction were: Ursuline Convent, the Convent of Our Lady of the Sacred Heart, Saint Peter's Convent, Saint Paul's Convent, and seven parochial schools, the Concordia Lutheran College, Springfield Business College, and the Saint Agatha School. Besides the public and other libraries, S. had the state law library. Among the charitable institutions are the Home for the Friendless, the Home for Aged Women, the Home for Aged People under the control of the Roman Catholic Church, the Orphanage of the Holy Child, and the Colored Old Folks' Home. The most notable structure in the city, and one of national interest, is the grand obelisk, crypt, and memorial hall erected in Oak Ridge Cemetery, by popular national subscription, to the memory of Abraham Lincoln, and now containing his remains and those of his sons Eddie and Willie, and his grandson Abraham. The obelisk is 98 ft. 4½ in. from ground-line to apex, with 5 crypts

and a memorial hall at its base. The state of Ill. has bought and preserves Lincoln's home in S. S. was first settled in 1819 and was laid out in 1823 at which time it became the county-seat. It was first incorporated as a town in 1832 and was chartered as a city in 1840. It was selected as the state capital in 1837. The city is governed by a mayor, elected biennially, and a unicameral council. The water-works are owned by the city and have a daily capacity of 12,000,000 gallons. There is a complete sewage system, electric light plant, 25 m. of electric street railway, 366 acres of improved park land, and 30 m. of paved streets. Pop. (1910) 51,678.

SPRING'FIELD: city, cap. of Hampden co., Mass.; on the Connecticut river, and on the Boston and Albany division of the New York Central, the Connecticut and Passumpsic division of the Boston and Maine, and the Hartford, Highland and Central New England divisions of the New York, New Haven and Hartford railroads; 98 m. w. of Boston, 136 m. n.e. of New York; 34½ sq. m. The site is level at the river, but rises gradually toward the e.; the streets are wide, straight, and ornamented with choice shade-trees; and the city is well paved, sewered, watered, and lighted. There are numerous public parks, the largest being Forest Park, laid out 1884, and containing 464 acres. In 1905 the net public debt was $1,257,300; assessed valuation of all taxable property $80,904,476. There were over 50 churches—some of fine architecture—9 nat. banks (cap. $3,100,000), 3 savings-banks (surplus $473,389), and 1 safe deposit com. (cap. $500,000). In 1905 there were 11,000 pupils in the public schools, and 1,500 at private and parochial schools; 34 school buildings and 374 teachers, including high, manual-training, and normal-training schools, free evening draughting and drawing schools. Springfield is the seat of the French-American College, opened in 1885, and the International Y. M. C. A. Training School. There is a public library here containing 130,000 volumes, and the Hampden County Law Library dating from 1813. The facilities and collections of the art and science museums —departments of the City Library—are perhaps unrivalled in any city of similar size in the country; the library itself is of unusual efficiency. The notable buildings are the co. court-house (cost $500,000); union railroad depot completed 1889 ($750,000); U. S. custom-house and post-office completed 1889 ($150,000); city-hall, in the Romanesque style, containing a public hall with nearly 3,000 seating capacity; the Science Museum; the Art Museum; U. S. arsenal, with storage capacity of 300,000 stand of arms; U. S. national armory, located by Washington 1794, where a large force of men is constantly employed in manufacture of breech-loading rifles,

and where, during the civil war, by working day and night, more than 800,000 guns were made, at a cost of $12,000,000; and the Church of the Unity (Unitarian), Memorial Church, North Church (Congl.), South Church (Congl.); also a fine Prot. Episc. church, and the Cathedral of St. Michael (Rom. Cath.). In 1900 there were 817 manufacturing establishments, which had $17,105,947 capital and $21,207,039 products. The principal manufactures now are army-rifles, sporting arms, revolvers, cotton and woolen goods, paper, envelopes, railroad cars, sewing-machines, dictionaries, skates, valves, buttons, needles, toys, printed books, art goods, confectionery, tobacco products, forgings, machinery, bicycles, automobiles, and electrical supplies. The city is governed by a mayor, elected annually, and a bicameral council. The municipal expenses aggregate about $1,500,000 annually, including $375,000 for schools; $195,000 for streets; $115,000 for fire department; $86,000 for police; $74,000 for lighting, and $54,000 for the poor. The water-works are owned and operated by the city. The system cost over $2,000,000. S. was settled 1635, was long known by the Indian name Agawam, received its present name 1640, was burned by the Indians during King Philip's war 1675, and became a city 1852. Pop. (1890) 44,164; (1900) 62,009; (1910) 88,926.

SPRING'FIELD: city, cap. of Greene co., Mo.; on the Kansas City, Fort Scott and Gulf, and the St. Louis and San Francisco railroads; 130 m. s. of Jefferson City, 243 m. w.s.w. of St. Louis. It is on the summit of the Ozark Mountains, and, being the trade centre for all of s.w. Mo. and n. Ark., has had rapid growth. The region is developing some of the richest zinc and lead mines in the world. The city has a remarkably mild and healthful climate, and has spent large sums in local improvements and to aid railroad construction. Both railroad companies, under local inducements, have located their repair and machine shops here, the Kansas City, Fort Scott and Gulf having a plant that cost $300,000, and the St. Louis and San Francisco one that cost nearly $1,000,000. There is a public park and a little s. of the city there is a national cemetery containing the graves of more than 2,000 Union and Confederate soldiers. S. has excellent water-supply from a spring in the mountains, is laid out with regularity, has gas and electric lights, 6 m. of street railroad, and 30 m. of water mains, and does a large manufacturing business. On 1903, Feb. 1, the total debt was $192,000, floating debt $6,000, sinking fund $32,000, net debt $160,000; total assessed valuation $8,087,760, of which $5,707,476 was real and $2,380,284 personal property; tax rate $9.70 per $1,000. There were 40 churches, with property valued at $700,000. The

principal public buildings are the government buildings, county court-house, municipal buildings, Saint John's Hospital, Springfield Frisco Hospital, the bank buildings, and several fine building blocks. The educational institutions are a State Normal School, Loretto Academy (Roman Catholic), Drury College (Congregational), public and parish elementary schools, and a public library. In 1901 the enrollment in public schools was 5,469; teachers, 79. In 1902 there were 2 national banks (cap. $200,000), 5 state banks, 1 private bank (cap. $725,000), and 3 daily, 5 weekly, 2 semi-monthly, and 3 monthly periodicals. There were (1900) 245 manufacturing establishments, with capital of $2,111,048, and 2,127 wage-earners; value of products, $4,126,871. There were 9 tobacco factories, 4 flour mills, 3 lumber mills, 2 brush and broom works, 4 carriage factories. The city was incorporated in 1831, and during the Civil war was in the possession alternately of the Federal and Confederate forces. The battle of Wilson's Creek, 1861, Aug. 10, occurred in the vicinity; the Union forces were defeated and the Union general, Nathaniel Lyon, was killed. Pop. (1900) 23,267; (1910) 35,201.

SPRINGFIELD, N. J.: township in Union co.; on the Rahway river, and on the Delaware and Lackawanna railroad; 7 m. s.w. of Newark. The chief manufactories are boot and shoe factories, paper mills, and hat factory. Springfield is celebrated as the scene of a battle between the American and British forces, 1780, June 23. The British, under Gen. Knyphausen, advanced from Elizabethtown about 5 o'clock in the morning. They were opposed by Gen. Greene, but owing to the superior number of the enemy he was compelled to evacuate Springfield, which was then burned by the British. During the action the Rev. James Caldwell, chaplain in the New Jersey brigade, is said to have distributed the hymn books from the neighboring Presbyterian church among the soldiers for wadding, saying at the same time, 'Now put Watts into them, boys.' This battle prevented further advance on the part of the British. The American loss was about 72 and that of the British about 150. Pop. (1900) 1,073; (1910) 1,246.

SPRING'FIELD: city, cap. of Clarke co., O.; on Mad river, and on the Pittsburg, Cincinnati, Chicago and St. Louis, the Cleveland, Cincinnati, Chicago and St. Louis, the Erie, and the Detroit Southern railroads; about 45 m. w. of Columbus. Five lines of electric railways provide direct connections with the cities of Columbus, Dayton, Xenia, Urbana, Bellefontaine, Troy, and Piqua. It is in a naturally rich and well-cultivated region; has abundant water-power from Mad river and Lagonda creek; and ranks first among American cities in manufacture of agricultural implements. In 1905 it had net public debt $1,012,437; assessed valuation of all taxable property $19,500,000; 5 national banks (cap. $1,000,000);

1 state bank for savings (cap. $76,000); total deposits $5,214,520. There were 50 churches; court-house (cost $125,000); new city-hall (cost $225,000); U. S. custom-house and post-office ($150,000); public library (cost $100,000); lyceum opera-houses; more than 20 m. of macadamized roads leading to the suburbs; 30 m. of street railroads; gas and electric-light plants; board of trade; and water-works (cost $800,000). The city hospital, founded by the liberal donations of Ross Mitchell and J. H. Thomas and endowed in the sum of $100,000 in government bonds by John Snyder, was erected and furnished at a cost to the city of $100,000. It is equipped with every appliance and convenience essential to its use. The city prison and patrol station, the cost of which was $20,000, is of modern design and construction. Three state fraternal homes have been erected on the hills which border the city. These homes are maintained by the brotherhood of the Masonic craft, the Independent Order of Odd Fellows, and the Knights of Pythias. There are 19 public school buildings, four Roman Catholic parish schools, two private business colleges and several private schools. The Springfield Seminary is one of the large city schools. The Wittenberg College was founded in 1845 by the Lutheran Church. The Warder public library, which cost $100,000, is a gift from Benjamin H. Warder. It contains 20,000 volumes and is maintained by an annual appropriation. More than a score of literary clubs contribute to the culture and refinement which are marked characteristics of the people of the city. The manufactures include gas and steam engines, piano plates, machinery in vast variety, tools, mechanical appliances and factory supplies, in iron, steel, and brass. Periodical publications of high class and national renown, and floral industries exceeded in aggregate extent by those of few cities in the Union, contribute to Springfield's commercial prestige and distinction. Flour, medicine, food, wearing apparel, chemical, coffin, rubber, and paper manufactures add variety to the list of Springfield's notable products. The government census of 1900 gives the total number of manufacturing establishments as 305; the amount of capital invested, $14,091,175; the number of employees, 6,638; the average annual wages, $3,160,119; and the average value of the annual products, $12,777,173. There were 7 large manufactories of agricultural implements, with an invested capital of $8,194,543. The 30 foundry and machine-shops had a combined capital of $2,772,036. They had 2,197 employees, to whom was paid annually, on an average, wages amounting to $1,084,681. The value of the annual products was $3,097,910. Since 1900 there has been a notable increase in the amount of manufacturing. There are now about 10,000 employees in the various industries and the value of the annual output is about $18,000,000. Springfield was laid out 1801, became

the county-seat 1819, and began to be noted as a manufacturing centre 1860. Pop. (1910) 46,921.

SPRINGHALT, n. *sprĭng'hawlt* [*spring,* and *halt*]. See STRINGHALT.

SPRINGS, MECHANICAL: elastic material applied in very various forms for different purposes. The simplest form is a piece of elastic metal wire, rolled on a mandrel, forming a continuous single cylindrical coil of any length needed. Clock and watch springs are flat coils of thin bands of steel. The *balance-spring* of watches is of fine wire often thinner than hair. Coach-springs are formed of a series of curved narrow plates of steel of different sizes, placed one over another, the largest at the bottom, and the others in regular succession according to size—the whole held together with nuts and screws. These are some of the commonest forms, but very many others are in use. A spiral spring is one shaped like the main spring or hair spring of a watch. Such a spring lies wholly between two parallel planes whose distance apart is equal to the width of the wire or tape of which the spring is made. They possess the remarkable property of resisting distortion, when used, for example, to actuate a watch or chronometer balance, with a force which is very closely proportional to the amount of the distortion. It is this property which insures the isochronism of the motion of a watch or chronometer balance. Helical springs, also commonly called spiral springs, are formed by winding wire into a helix about a right circular cylinder. They also possess the remarkable property of resisting elongation with a force which is nearly proportional to the amount of the elongation.

SPRINKLE, v. *sprĭng'kl* [Dut. *sprenkelen,* to sprinkle: Ger. *sprenkeln,* to mark with scattered spots: Sw. *sprackla,* speckled, freckled]: to scatter; to disperse; to scatter a liquid; to cleanse or purify by sprinkling: N. a small quantity scattered. SPRIN'KLING, imp. *-klĭng:* ADJ. scattering in small drops: N. a small quantity scattered in drops; a small number distributed among a large. SPRINKLED, pp. *spring'kld.*

SPRINTING, *sprĭnt'ĭng:* term in amateur and professional sport, denoting short-distance foot-race, run at full speed. Sprinting in the United States has become the most popular form of foot-racing, and has distinct rules and records. As a sprint-race is a steady spurt from line to tape, the distance must be short. The most approved distance is 100 yards, but some professionals prefer 120-130 yards, and others a quarter mile or 440 yards. A special training is required for sprinting, and much more than usual depends on the form or style of the start. The best amateur records (1908) were: 50 yards, V. S. Rice, R. X. Murray, and W. D. Eaton, $5\frac{2}{5}$ sec.; 75 yards, L. H. Cary, B. J. Wefers, Archie Hahn, $7\frac{3}{5}$ sec.; 100 yards, D. J. Kelly, James Rector, $9\frac{3}{5}$ sec.;

120 yards, B. J. Wefers, 11⅘ sec.; 150 yards, C. H. Sherrill, J. Owen, Jr., 14⅕ sec.; 440 yards, M. W. Long, 47 sec.;—professional: 50 yards, H. M. Johnson, 5¼ sec.; 100 yards, H. Bethune and H. M. Johnson, 9⅘ sec.; 440 yards, R. Buttery, 48¼ sec. The best mile—too long to be called a sprint, though sprinting was done in it—was done by W. G. George as a professional in 4 min. 12¾ sec., and by T. P. Conneff as an amateur in 4 min. 15⅖ sec.

SPRIT, v. *sprĭt* [Norw. *spretta,* to split, to spring asunder or shoot like leaves: Dut. *spriet,* a piece of cleft wood, a spear, a bowsprit: Dan. *spröd,* a sprit]: to sprout; in *OE.,* to throw out with force from a narrow orifice: N. a sprout; a shoot. In a vessel, a diagonal yard or spar, crossing and sustaining a quadrilateral (usually square) fore-and-aft-sail: the sprit's heel is held on the mast in a ring of rope, called a 'snotter,' and its head reaches to the after upper corner of the sail. BOWSPRIT, n. *bō'sprĭt,* large boom or spar which projects over the stem of a ship or boat to carry sail-forward (see BOWSPRIT, under BOW). SPRIT-SAIL, sail extended over the stem of a ship or boat.

SPRITE, n. *sprīt* [a corruption of SPIRIT: F. *esprit,* spirit]: a spirit; a shade.

SPROAT, *sprōt,* EBENEZER: 1752-1805, Feb.; b. Middleborough, Mass.: soldier. He became a captain in the provincial army 1775; was promoted major, lieutenant-colonel and colonel of the 2d Massachusetts regiment; was in Glover's brigade at the battles of Trenton, Princeton, and Monmouth; and was brigade-inspector under Baron Steuben. After the war he engaged in surveying in Providence; in 1786 began the survey of the Ohio territory; and 1788 was at the head of the emigrants that settled Marietta, where for 14 years he was sheriff and colonel of militia.

SPROD, n. *sprŏd* [Gael. *bradan,* a salmon: perhaps only a corruption of *sprout,* and also see SPRAT]: a salmon in its second year.

SPROUT, v. *sprowt* [akin to *spurt, sputter,* and *spirt:* Dut. *spruiten,* to sprout: Dan. *sprutte;* Ger. *sprudeln,* to spurt, to spout]: to bud or germinate; to grow like buds or shoots of plants: N. the shoot or bud of a plant. SPROUT'ING, imp.: ADJ. germinating: N. the act of shooting or germinating. SPROUT'ED, pp. SPROUTS, n. plu. young coleworts. BRUSSELS SPROUTS, coleworts whose prominent leaf-buds are used for culinary purposes.

SPRUCE, a. *sprôs* [Icel. *sparkr,* brisk, lively: Gael. *spruiseil,* neat, trim: Sw. *spricka,* to shoot: Swiss, *sprützen,* to spring with elastic force]: neat or fine in dress; trim; foppish: V. to dress with affected neatness. SPRU'CING, imp. SPRUCED, pp. *sprôst.* SPRUCE'LY, ad. *-lĭ.* SPRUCE'NESS, n. *-nĕs,* the state or quality of being spruce; trimness. TO SPRUCE UP, to dress neatly.

SPRUCE, n. *sprōs* [Ger. *sprossen*, sprouts, especially of a species of fir, a decoction of which was formerly much in use on the shores of the Baltic as remedy for scorbutic and other diseases]: name given to several kinds of fir-trees (see FIR). SPRUCE-BEER, liquor flavored with the essence of spruce. This essence is obtained by boiling the green tops of the Black Spruce (*Abies nigra*), Norway Spruce (*Picea excelsa*), and perhaps other varieties, in water, and then concentrating the decoction by another boiling without the spruce-tops. The young shoots of this fir, like most of its family, are coated with a resinous exudation, which is dissolved in the water. The beer is made by adding the essence of spruce to water in which sugar or molasses has been dissolved, in proportion of about four ounces of essence of spruce to ten lbs. of sugar or three quarts of molasses, and 10 or 11 gallons of water, with about half a pint of yeast. Various spices are used for flavoring. Spruce beer is of some use as an antiscorbutic; and the Antiscorbutic Beer of the Russian Army Pharmacopœia is made by mixing spruce-tops and fresh horseradish root with common beer—ginger and *Calamus aromaticus* being added for flavoring, and, after fermentation, a little cream of tartar, tincture of mustard, and proof-spirit.

SPRUE, n. *sprō* [etym. doubt.]: the ingate of a mold, through which the metal is poured; the piece of metal attached to a casting, occupying the gate through which the metal was poured; a piece of metal or wood used by a molder in making the ingate through the sand.

SPRUNG, *sprŭng:* pt. and pp. of SPRING, which see.

SPRY, a. *sprī* [a softened pronunciation of *sprag* 2 or *sprack:* prov. Sw. *sprygg*, skittish]: nimble; active; alert.

SPUD, n. *spŭd* [Dan. *spyd*, a spear: Sw. *spode*, a rod: Norw. *spode*, *spuda*, a stick for turning bread in the oven: perhaps a mere corruption of *spade*]: a narrow spade used for destroying weeds; a short thick concave blade with wooden handle for grubbing up specimens in botanizing; a short thick thing, in contempt; *vulgarly*, a potato.

SPUE, v. *spū:* a common spelling of SPEW, which see. SPU'ING, imp. SPUED, pp *spūd*.

SPULLER, n. *spŭl'lĕr* [for *spooler*—from SPOOL, which see]: one employed to inspect yarn.

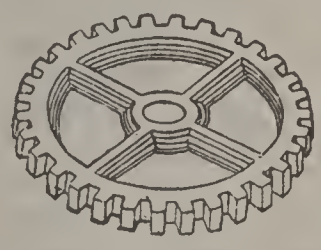
SPULYE, or SPULYIE, or SPULZIE, n. *spŭl'yĭ* [F. *spolier*—from L. *spolĭārĕ*, to spoil]; in *Scot.*, to lay waste; to carry off; to spoil: N. spoil; in *Scots law*, illegal interference with movable property.

SPUME, n. *spūm* [L. *spūma*, foam, froth—from *spuĕrĕ*, to spit]: froth; foam; scum: V. to froth; to foam. SPU'MING, imp. SPUMED, pp. *spūmd*. SPUMY, a. *spū'mĭ*, or SPU'MOUS, a. *-mŭs*, consisting of froth or scum; frothy. SPUMESCENCE, n. *spū-mĕs'sĕns*, frothiness. SPUMIF'EROUS, a. *-mĭf'ĕr-ŭs* [L. *fero*, I bear]: producing foam.

SPUN, v. *spŭn:* pp of SPIN, which see. SPUN-HAY, hay twisted into ropes. SPUN-GOLD, n. a flattened silver-gilt wire, wound on a thread of yellow silk. SPUN-SILK, n. cheap article produced from short-fibred and waste silk; frequently mixed with cotton. SPUN SILVER, n. thread of coarse silk or singles, wound with flattened silver wire SPUN-YARN, rope yarn twisted into a rope

SPUNK, n. *spŭngk* [Ir and Gael. *sponc*, sponge, touch-wood: L. *spongĭa;* Gr. *sponggia*, a sponge—touchwood being so called from its porous nature]: wood that readily takes fire; touchwood, spirit; mettle; vivacity; in *Scot.*, a spark; a lucifer-match. TO SPUNK OUT, to come to light; to be discovered. SPUNK'Y, or SPUNK'IE, a. *-ĭ*, quick; spirited; irritable.

SPUR, n. *spĕr* [AS. *spura*, a spur: Ger. *sporn;* Sw. *sporre;* Dan. *spore;* Dut. *spoor*, a spur]: instrument having a small wheel with sharp points, worn on the heels of a horseman's boots, for goading a horse to further speed: it is used much less than formerly. All cavalry soldiers wear spurs; but their use, except in the heat of an actual charge, is discouraged as much as possible. In the days of chivalry, the use of the spur was limited to knights, and it was among the emblems of knighthood. To win the spurs was, in the days of chivalry, to earn knighthood by gallant conduct: thence, as in modern phrase, to gain the desired honors or rank. The degradation of a knight involved the hacking off of his spurs. The serving before a knight of a pair of spurs on a dish was a strong hint by his host that he had outstayed his welcome.—In general, spur denotes any incitement or stimulus to increase effort: the sharp horny projection on a cock's leg: the largest and leading root of a tree: any projecting appendage of a flower or blossom having the appearance of a spur: ergot: anything standing out; a mountain branching from a range; anything resembling a spur: V. to incite or urge forward with a spur; to urge to more vigorous action: to incite; to impel; to press forward. SPUR'RING, imp. SPURRED, pp. *spĕrd:* ADJ. wearing or having spurs; affected with spur or ergot, as *spurred* rye. SPUR'LESS, a. *-lĕs*, without a spur. SPURRIER, n. *spŭr-rĭ-ĕr*, one who makes spurs. SPUR-WHEEL, a wheel having cogs around the rim, but pointing toward its centre. SPUR-GALL, v. to gall or wound with a spur. SPUR'-GALLED, imp. *-gawld:* ADJ. galled or wounded with the spur. TO WIN HIS SPURS, to gain the rank of knighthood and the gift of spurs: thence to gain the academic honors or social position aimed at.



Spur-wheel.

SPURGE, n. *spĕrj* [OF. *spurge, espurge*, garden-spurge; *espurger*, to purge, to cleanse—from L. *ex*, out, thoroughly; *purgo*, I purge], (*Euphorbia*): genus of plants of nat. order *Euphorbiaceæ*, having monœcious naked flowers, male flowers membranous and surrounding a tricoccous stalked female flower, the whole placed within a cup-shaped in-

volucre. The fruit has three valves and three cells, the cells one-seeded and bursting elastically. The species are very numerous, natives of warm and temperate climates, mostly herbaceous, but some woody. All contain a resinous, milky juice, which in most is very acrid. SPURGE-LAUREL, the *Daphnē laurĕŏla*, ord. *Thymel'æăcĕæ*, whose berries are poisonous. See DAPHNE.

SPURGEON, CHARLES HADDON: English Baptist preacher: b. Kelvedon, Essex, 1834, June 19; d. Mentone, France, 1892, Jan. 21. He was the son of a Congregational minister and was educated at Colchester and Maidstone. In 1849 he was appointed usher in a school at Newmarket, and soon after engaged in religious work at Cambridge and the neighborhood, being known locally as the 'boy preacher.' Having joined the Baptist body he accepted the pastorate of a small Baptist congregation at Waterbeach at 18. Becoming known for his eloquence he was called, in 1854, to the pastorate of the Baptist chapel in New Park street, Southwark, and this, becoming too small for his audience, his congregation successively removed to Exeter Hall and the Surrey Music Hall, and ultimately built, in 1861, the great Metropolitan Tabernacle, which could accommodate 6,000 persons. Here he preached and labored for the rest of his life, his discourses attracting hearers from all parts of the world. Besides his ordinary ministrations, and the publication from 1855 of a weekly sermon, he founded the Pastors' College, at which the ministers of 36 London chapels were trained by him, the Stockwell Orphanage, alms-houses, schools, etc. Earnestness, simplicity, directness, liveliness, and not infrequently a genuine touch of humor were the chief characteristics of his sermons. Sagacity, common sense, straightforwardness, hatred for sham and falsity were prominent traits of his character as a man. He was the author of numerous volumes, among which the best-known are: *The Saint and his Saviour* (1867); *John Ploughman's Talk* (1868); *Feathers for Arrows* (1870); *The Treasury of David*, a commentary on the Psalms—extending to seven volumes (1865-80); *Types and Emblems* (1875); *The Metropolitan Tabernacle and its Work* (1876); *Farm Sermons* (1882); *The Present Truth* (1883); *Storm Signals* (1886); *Salt Cellars* (1889); and he edited the monthly magazine *Sword and Trowel*. Consult *Life* by Shindler (1892).

SPURGEON, THOMAS: English Baptist clergyman, son of C. H. Spurgeon: b. London, England, 1856, Sept. 20. He was educated at the Pastors' College, studied art, and visited Australia and Tasmania in 1877 and in 1879. In 1880-9 he was in charge of the Baptist Church at Auckland, New Zealand, and was evangelist of the New Zealand Baptist Union in 1889-93. Since 1894 he has been pastor of the Baptist Church, Metropolitan Tabernacle, London. He is editor of *Sword and Trowel*

and has published *The Gospel of the Grace of God* sermons (1884); *Scarlet Threads and Bits of Blue,* poems (1892); *My Gospel,* sermons (1902); *Light and Love,* sermons (1897); *My Gospel* (1902); etc.

SPURIOUS, a. *spū'rĭ-ŭs* [L. *spurĭus,* spurious: It. *spurio*]: not real or genuine; not proceeding from the true source; counterfeit; false. SPU'RIOUSLY, ad. *-lĭ.* SPU'RIOUSNESS, n. *-nĕs,* the state or quality of being spurious or not genuine.—SYN. of 'spurious': counterfeit; adulterate; false; fictitious; bastard; supposititious; sophisticated.

SPURN, v. *spėrn* [AS. *speornan,* to kick: Icel. *sperna,* to kick: Gael. *spairn,* an effort: L. *spernĕrĕ,* to despise]: to drive back, as with the foot; to reject with disdain; to manifest disdain or contempt in rejecting anything: N. in *OE.,* disdainful rejection; a kick; insolent and contemptuous treatment. SPURN'ING, imp. SPURNED, pp. *spėrnd.* SPURN'ER, n. *-ėr,* one who spurns.

SPURN HEAD, *spėrn hĕd:* extreme point of a long, low, narrow, and shingly peninsula in s.e. Yorkshire, England; at the mouth of the Humber, 24 m. s.e. of Hull. Two light-houses have been built here, one of which is in lat. 53° 34′ 7″ n., long. 0° 7′ 2″ e.

SPURRIER. See under SPUR.

SPURRY, or SPURREY, n. *spŭr'rĭ* [OF. *spurrie;* Ger. *spōrgel,* spurry: new L. *spergŭla*]: plant of genus *Spergŭla,* ord. *Illecebrācĕæ,* but variously ranked by botanists. It is an annual, dichotomously branched, or with whorled branches; leaves linear-filiform, in clustered whorls, with membranaceous stipules; flowers in terminal divaricating corymbs. The flowers have a calyx of five sepals, five white petals, five or ten stamens, and five styles; the capsule is five-valved, with numerous round seeds, surrounded with a membranous border. There are 2 or 3 species of Spergula common to temperate regions of both the e. and w. hemispheres. COMMON SPURRY, or YARR (*S. arvensis*), is plentiful in corn-fields, especially on light stony or sandy soils. In some parts of Europe, a larger variety is frequently sown for fodder, and is relished by cattle; and in Germany the spurry is cultivated sometimes to be plowed into sandy soils.

SPURT, n. *spėrt* [see SPROUT: Dut. *spruiten,* to sprout: Sw. *spruta,* to spirt: Gael. *spairt,* a splash, a drop]: a forcible ejection, suddenly or repeated at intervals, of a liquid substance from a tube or small opening; a jet; a great or sudden effort: V. to throw out forcibly in a stream, as water; to rush or issue out, as jet, suddenly or at intervals. SPURT'ING, imp. SPURT'ED, pp. SPURTLE, v. *sprēt'l,* to issue out in a scattering manner: N. in *Scot.,* a short rod used to stir porridge while cooking. SPURT'LING, imp. *-lĭng.* SPURTLED, pp. *spėrt'ld;* also SPIRT and SPIRTLE in the same sense. See SPIRIT.

SPURZHEIM, *spûrts'hīm,* JOHANN GASPAR: German

physician and phrenologist: 1776, Dec. 31—1832, Nov. 10; b. Longwich, near Treves. While studying medicine at Vienna, he was introduced to Dr. F. J. Gall, whose pupil, and afterward colleague, he became, in investigating the structure and functions of the brain (see PHRENOLOGY. In 1807 they settled in Paris, but parted 1813; and next year Spurzheim went to England, where he published *The Physiognomical System of Drs. Gall and Spurzheim* (London, 1815), *Outlines* of the same (1815), and a treatise on *Insanity* (1817). The first of these works having been severely handled by Dr. John Gordon in *Edinburgh Review,* No. 49, Spurzheim proceeded to Edinburgh, and, in the lecture-room of his critic, demonstrated the reality of the anatomical discoveries which had been denied and ridiculed. To the same and other opponents, he replied in *An Examination of the Objections made in Britain against the Doctrines of Gall and Spurzheim* (Edinburgh, 1817). It was about this time, and under his tuition, that George Combe became a student of phrenology. After lecturing in many British and Irish cities, Spurzheim returned 1817 to Paris; but from 1825 till his death, he resided much in England, teaching and defending his opinions in lectures and books. In 1832 he went to America for the same purpose, and began his labors at Boston, but was cut off by fever in that year. Besides the English works above mentioned, he wrote: *Elementary Principles of Education* (Edinburgh, 1821; 2d edition, London, 1828; French translation, Paris, 1822); *Phrenology* (London, 1825); *Philosophical Principles of Phrenology* (1825); *Phrenology in Connection with the Study of Physiognomy* (1826); *Anatomy of the Brain* (1826), supplemented 1829 by an Appendix, with *Remarks on Charles Bell's Animadversions on Phrenology; Outlines of Phrenology* (1827); and *Sketch of the Natural Laws of Man* (1828). Some of these were reprinted at Boston. His French works (besides those written jointly with Gall) are: *Obs. sur la Folie* (Paris, 1818); *Obs. sur la Phrénologie* (1818); *Essai Philosophique sur la Nature Morale et Intellectuelle de l'Homme* (1820); and *Manuel de Phrénologie* (1832).

SPUTCHEON, n. *spŭch'on* [etym. doubt.]: the inner part of the mouthpiece of a sword scabbard, which retains the lining in place.

SPUTTER, v. *spŭt'tėr* [closely allied to SPOUT and SPIT: Low Ger. *sputtern;* Norw. *sputra,* to sputter, to spurt]: to spit in scattered drops, as in rapid speaking; to throw out liquid matter in scattered portions; to utter with hasty indistinctness: N. moist matter thrown out in particles or drops; stir; noise. SPUT'TERING, imp. SPUT'TERED, pp. *-tėrd.* SPUT'TERER, n. *-tėr-ėr,* one who sputters.

SPUTUM, n. *spū'tŭm* [L. *sputum,* spittle—from *spuĕrĕ,* to spit]: in *med.,* the matter expectorated from the mouth in disorders of the respiratory organs.

SPUYTEN DUYVIL CREEK, *spī'tn dī'vĭl krēk:* narrow tidal channel connecting the Hudson river with the Harlem, and through the Harlem with the East river and Long Island Sound. It forms the n. boundary of Manhattan Island, and is within the city limits. Being subject to sudden gusts of wind it was formerly considered dangerous for sailing-vessels, and is said to take its name from the remark of an old Dutch shipmaster, who, on being warned not to attempt to pass through it, replied that he would go through 'in spite of the devil.'

SPY, n. *spī* [OF. *espier;* It. *spiare;* Ger. *spähen;* L. *specĕrĕ,* to look, to watch: OHG. *spehon,* to look, to spy]: one who secretly watches the conduct, condition, etc., of a person, in order to report them to another; a secret agent; an emissary; one who in war enters an enemy's lines to discover and report his strength and plans: V. to discover at a distance; to gain sight of; to inspect or examine secretly; to find out by artifice; to play the spy. SPY'ING, imp. SPIED, pp. *spīd.* SPY-GLASS, a small telescope.—*Spy,* in war, is a useful though not always highly honored auxiliary, employed to ascertain the state of an enemy's affairs, and his intended operations. Spies have been used in all wars from the earliest times. Their employment is quite recognized by the law of nations as interpreted by Grotius, Vattel, and Martens; and it is not held to be the least dishonor to a general to avail himself of their services. Yet the spy himself is dealt with, by those against whom his work is directed, as an outlaw and as devoid of honor. If taken by the enemy, he is put to death ignominiously and without mercy. As the work is so dangerous, and so little redounds to honor, it is never permissible for a general to compel by threats any person, whether of his own or the hostile party, to act as spy; but he is at liberty to accept all such services when proffered. A spy is well paid, lest he betray his employer. Martial law, though distinct enough in ordering the death of a spy, is not clear in defining what constitutes a spy. A man—not of the enemy—within the enemy's lines, and in the enemy's uniform, would presumably be a spy; if in civil dress, and unable to give good account of himself, his chance of hanging would be considerable; but if found in one camp in the uniform of the opposite side, he is not to be treated otherwise than as a prisoner of war, or as a deserter from the enemy.

Both as regards honor and penalties, it seems that spies ought in fairness to be divided into two classes—first, those who betray their own country to an enemy; secondly, those who, being enemies, contrive surreptitiously to obtain information by penetrating into the opposing army. The first class are traitors in the strictest sense, and may fairly be adjudged worthy of an ignominious death; but the second class are often brave men, who risk all that a man has to lose in the service of their country. It is unfair to accord them the same treatment as the traitors.

SQUAB, a. *skwŏb* [imitative of the sound made by the fall of a soft lump: Ger. *quabbelig*, squab; *quabbeln*, to shake (see QUAVER)]: fat; plump; bulky; unfledged: N. anything thick and soft; a soft stuffed cushion; a thick fat person; an unfledged bird or nestling: AD. with a heavy sudden fall, plump and flat. SQUAB'BY, a. *-bĭ*, thick fat; heavy. SQUAB-PIE, a pie made of squabs or young pigeons, or one made of meat, apples, and onions.

SQUABBLE, n. *skwŏb'bl* [imitative of the dashing of water: Sw. *kabbla*, to wrangle: Norw. *svabba*, to splash: Ger. *schwabbeln*, to shake to and fro]: a low quarrel; a scuffle; a brawl: V. to contend; to wrangle. SQUAB'BLING, imp. *-blĭng:* N. the act of one who engages in a wrangling debate or petty quarrel. SQUABBLED, pp. *skwŏb'bld.* SQUAB'BLER, n. *-blĕr*, one who squabbles.—SYN. of 'squabble, v.': to contend; dispute; wrangle; scuffle; struggle; quarrel; brawl; fight.

SQUAD, n. *skwŏd* [F. *escouade*, a small body of men: Sp. *escuadra;* It. *squadra*, a troop or square of soldiers (see SQUARE)]: a group; a company; small party of soldiers assembled for drill or inspection—a troop or company of soldiers being divided into as many squads as there are officers or sergeants at hand to drill them. AWKWARD SQUAD, those recruits not yet fitted to take their places in the regimental line; also soldiers who have proved themselves so deficient and clumsy in drill as to be sent back to the lowest squad to be redrilled. SQUAD-BAG, a black canvas bag, allowed to every 25 men in the field or on march, to contain extra articles of attire, etc.

SQUADRON, n. *skwŏd'rŏn* [OF. *esquadron;* It. *squadrone;* Sp. *escuadron*, a squadron (see SQUAD)]: *primarily*, a body of troops drawn up in a square or in any form; the chief division of a regt. of cavalry, consisting of two troops—the number of squadrons in a regt. numbering three or four. The S. is the unit by which the force of cavalry with an army is always computed. In the U. S. army (1891) there were 10 cav. regts. of 12 companies or troops each, with an aggregate of 70 men to the co., and a separate troop of 69 men. In *naval affairs*, a detachment of a fleet, comprising not less than four vessels, and constituting the command of a flag-officer. SQUAD'RONED, a. *-rŏnd*, formed into squadrons.

SQUALID, a. *skwŏl'ĭd* [L. *squalĭdus*, filthy; *squalērĕ*, to be filthy: It. *squallido*]: poverty-stricken; extremely dirty. SQUAL'IDLY, ad. *-lĭ.* SQUAL'IDNESS, n. *-nĕs*, the state or quality of being squalid. SQUAL'OR, n. *-ĕr* or *squā'lĕr* [L. *squālor*, dirtiness]: foulness; filthiness.

SQUALL, v. *skwawl* [Icel *squala*, to scream: Dan. *squalder*, noisy talk: Sw. *squallra*, to tattle], to cry out; to scream: N. a loud scream or cry. SQUALL'ING, imp. ADJ. crying out harshly; screaming. SQUALLED, pp. *skwawld.*

SQUALL, n. *skwawl* [prov. Sw. *squala*, to gush out with a violent noise: Sw. *squal*, a rush of water]: a sudden storm of wind and rain. SQUALL'Y, a. *-ĭ*, abounding in sudden and violent gusts of wind. BLACK SQUALL, sudden and violent gusts of wind accompanied with rain and dark heavy clouds. WHITE SQUALL, a squall without rain and dark clouds. TO LOOK OUT FOR SQUALLS, to be on one's guard; to be on the watch.

SQUALOID, a. *skwā'loyd* [L. *squalus*, a shark; Gr. *eidos*, resemblance]: resembling or pertaining to the Shark family. SQUALIDÆ—SQUALUS: see SHARK.

SQUALOR: see under SQUALID.

SQUAM, *skwâm*, LAKE, or LAKE ASQUAM, *ăs-skwâm'*: singularly picturesque lake in N. H., about 3 m. n.w. of Lake Winnepesaukee, 6 m. e. of Plymouth. It is about 8 m. long and 5 m. wide, and has a great number of beautiful wooded islands. It receives the outlet of White Oak Pond (1 m. long) on the e.; and its waters flow through a short outlet into Little Squam Lake (2 m. long), and through this and Squam river into the Pemigewasset, one of the chief feeders of the Merrimack. It is navigated by small pleasure steamers. Its waters are clear. S. Lake is, in dimensions, the second lake in N. H.; and probably, outside of Maine, the second lake wholly comprised within New England.

SQUAMA, n. *skwā'mă*, plu. SQUA'MÆ, *-mē* [L. *squāma*, a scale of a fish or serpent]: in *bot.*, a scale; a part arranged like a scale. SQUA'MOSE, a. *-mōs*, or SQUA'MOUS, a. *-mŭs*, scaly; covered with scales; having a scale-like aspect, structure, or arrangement; in *anat.*, applied to a portion of the temporal bone. SQUAMOSAL, a. *skwă-mō'săl*, applied to one of the bones of the skull in the lower vertebrata, answering to the *squamous* portion of the temporal bone. SQUA'MIFORM, a. *-mĭ-fawrm* [L *forma*, a shape]: having the form of scales. SQUAMIGEROUS, a. *skwā-mĭj'ĕr-ŭs* [L. *gero*, I bear]: bearing or having scales. SQUAMATA, n. plu. *skwă-mā'tă*, the division of reptiles in which the integument develops horny scales. SQUAMATE, a. *skwā'māt*, scale-like; scaly.

SQUAMIPEN'NES: see CHÆTODONTIDÆ.

SQUAMULÆ, n. plu. *skwā'mū-lē* [dim. of L. *squāma*, a scale]: in *bot.*, minute membranous scales, occurring in the flowers of grasses; lodicules. SQUAMULOSE, a. *skwā'mū-lōs'*, having minute scales.

SQUANDER, v. *skwŏn'dĕr* [a nasalized form of Scot. *squatter*, to splash or spill a liquid, to disperse: Dan. *squatte*, to splash, to spirt, to squander: Sw. *squättra*, to squander]: to spend profusely or wastefully; to spend without economy or judgment. SQUAN'DERING, imp.: ADJ. prodigal; wasteful. SQUAN'DERED, pp. *-dĕrd:* ADJ. scattered; spent lavishly and wastefully. SQUAN'DERER, n. *-dĕr-ĕr*, one who squanders. SQUAN'DERINGLY, ad. *-lĭ*.—SYN. of 'squander': to waste; scatter; disperse; dissipate; expend; spend.

SQUARE, a. *skwär* [OF. *esquarré;* It. *squadro,* square—from L. *ex,* out; *quadrārĕ,* to square; *quadrus,* four-cornered—from *quatŭor,* four]: having four equal sides and four right angles; forming a right angle; having a straight front; not curved or round; fitting; that does equal justice; suitable; even: not leaving a balance; stout; well set; right or honest, as on the *square, square*-dealing; in *OE.*, parallel; exactly suitable: N. figure having four equal sides and four right angles (see PARALLELOGRAM): space of ground having four straight sides, with houses fronting inward erected on at least three sides: product of a number multiplied by itself (see below): instr. for drawing straight lines and tracing right angles; a body of troops in the form of a square (see below): level; equality; regularity; rule; conformity: in *OE.*, quaternion; number four; an astrological situation of planets distant 90° from each other: V. to form with four equal sides and four right angles; to reduce to a given standard; to adjust or regulate; to balance; to make even; to multiply into itself, as a number; to suit; to fit with; to determine the exact contents of in square measure, as the area of a circle; to take up the attitude of a boxer; in *OE.*, to quarrel; to go to opposite sides. SQUAR'ING, imp. SQUARED, pp. *skwärd:* ADJ. made in the form of a square; adjusted; regulated. SQUARE'LY, ad. *-lĭ.* SQUARE'NESS, n. *-nĕs,* the state of being square. SQUAR'ISH, a. *-ĭsh,* nearly square. SQUARE MEASURE, measure having length and breadth. SQUARE NUMBER, product resulting from any number multiplied into itself; the second power of a number. SQUARE-PIERCED, in *her.*, term applied to a charge perforated with a square opening, to show the field. SQUARE ROOT, that part of a number which, when multiplied into itself, produces the number (see SQUARE and SQUARE ROOT). SQUARE-RIGGED, a. having the principal sails of a vessel extended by yards instead of stays. SQUARE-SAIL, four-sided sail extended to a yard. SQUARE-TOED, having the toes square; precise; punctilious. SQUARE-TOES, an old-fashioned formal person ALL SQUARE, all settled; all right. ON THE SQUARE, in an open fair manner; honestly. HOLLOW SQUARE, body of soldiers drawn up in the form of a square, with a space in the centre for the officers, staff, etc. (see SQUARE, in Military Evolutions). OUT OF SQUARE, does not correspond with facts; crooked in the reasoning. TO SQUARE THE CIRCLE, to undertake an impossibility (see QUADRATURE OF THE CIRCLE). *Note.*—In such expressions as *four square yards* and *four yards square,* the *former* signifies an area or space containing 4 spaces, each a yard long and a yard broad; the *latter* signifies four yards long multiplied by four yards broad, producing 16 *spaces,* each a yard long and a yard broad. When the expressions are restricted to *unity* or *one,* the results are the same—thus, *one square yard* is identical in result with *one yard square.*

SQUARE, in Military Evolutions: body of troops formed into a rectangular figure, with several ranks or rows of men facing on each side. With men of ordinary firmness, a square should resist the charges of the heaviest horse.

The formation is not new, for a Grecian syntagma was a solid square of 16 men in every direction; but in modern warfare, the solid square having been found cumbrous, has been abandoned for the hollow square, with officers, horses, colors, etc., in the centre. The front rank kneels, and the next two stoop, which enables five ranks of men to maintain a rolling fire on any advancing enemy, or to pour in a murderous volley at close quarters.—When orders or proclamations are to be read to troops, the files of the hollow square face inward instead of outward.

SQUARES, METHOD OF LEAST: in astronomy, the best mode hitherto discovered of obtaining the most correct result from a number of observations on any phenomenon. These observations are assumed to differ slightly from each other, and to be all of equal value, i.e., taken under equally favorable conditions and with equal instruments. The ordinary and long-established mode of approximating to the truth in such cases is by finding the arithmetic mean, and accepting it as the correct result; but in all cases where the result required does not come directly from observation, but requires to be discovered by calculation, this simple and useful method is inapplicable, and that of 'Least Squares,' which gives more probable corrections, is adopted. The method is founded on a theorem propounded first by Legendre 1806, more for insuring uniformity among calculators than from belief in its intrinsic value; but it was afterward thoroughly discussed and proved by Gauss and Laplace, that 'if the mean of a number of distinct observations be so taken that the sum of the squares of its differences from the actual observations (generally designated *errors*) shall be a minimum, this mean will be, under these circumstances, the correctest obtainable value.' The process by which the mean thus obtained is shown to be the most trustworthy approximation is too long for insertion here; but an example is given of the most common form of the method as occurring in astronomy. Let there be a series of equations—

$$\begin{aligned} X &= x + y + 2z, \\ X_1 &= 3x + 2y + 5z, \\ X_2 &= 4x + y + 4z, \\ X_3 &= -x + 3y + 3z; \end{aligned}$$

where the unknown quantities are x, y, and z, connected by various (the more the better) equations with X, X_1, etc., quantities which must be determined by actual observation. Suppose the values of the quantities thus found to be 3, 5, 21, and 14, then, since by hypothesis all these four observations are erroneous, the errors are $3 - X$, $5 - X_1$, $21 - X_2$, $14 - X_3$, or

$$\begin{aligned} 3 &- x - y - 2z, \\ 5 &- 3x - 2y - 5z, \\ 21 &- 4x - y - 4z, \\ 14 &+ x - 3y - 3z. \end{aligned}$$

The squares of these four errors are now added together; and, to find the values of x, y, and z, which will render this sum (call it S) a minimum, we must differentiate S

with respect to x, y, and z in turn, and putting each of these partial differential coefficients equal to zero, we obtain the three equations, $-88 + 27x + 8y + 30z = 0$; $-76 + 8x + 15y + 25z = 0$, and $-157 + 30x + 25y + 54z = 0$; from which the most trustworthy values of x, y, and z, can be found by common algebra.—See a paper by Ellis in *Cambridge Transactions*, VIII.

SQUARE AND SQUARE ROOT: particular cases of *Involution and Evolution* (q v.), in which the second power and root alone are involved. The process by which the sq. root of a number is obtained resembles division, differing only by the circumstance that the divisor is changed at each successive step. The rule adopted in arithmetic is deduced from algebra in the following manner: The sq. of $a + b$ is $a^2 + 2ab + b^2$, which may be written $a^2 + b(2a + b)$, and to find the sq. root of the latter, we have merely to subtract a portion (a^2), taking care that it be a sq. number, and forming a divisor with twice the sq. root of this portion ($2a$) increased by (b) the remainder of the root (which, in arithmetic, must be found by trial, as in division), and putting (b) the remainder of the root now found, in the quotient, proceed as in division. This mode of obtaining a divisor from the part of the root already obtained (a), and the part next to be obtained (b), and employing it, must be repeated till the whole sq. root is found. In the extraction of the sq. root in arithmetic, it is assumed that the squares of the nine digits are known; and also that the sq. of a number contains either twice, or one less than twice, as many digits as the number itself contains; the former being the case when the sq. number has an *even* number of digits, the latter when the number of digits is *odd*. By dividing, then, a number into periods of two figures each, we can at once see how many digits its root contains. To illustrate the method of operation adopted in arithmetic and algebra, let the sq. root of 128,881 be required; remembering that the sq. of $a + b + c$ is $a^2 + 2ab + b^2 + 2(a + b)c + c^2$:

$$
\begin{array}{rl}
 & 12,88,81\ (300 + 50\ (\text{or } 350) + 9 = 359 \\
(a^2 =)\ 300^2 = & \underline{\ \ 90000} \qquad a + b\ (\text{or } a + b) + c \\
 & \ \ 38881 \\
(2ab + b^2 =)\ 2 \times 300 \times 50 + 50^2 = & \underline{\ \ 32500} \\
(2\,(a + b)\,c + c^2) & \ \ \ \ 6381 \\
2 \times 350 \times 9 + 9^2 = & \underline{\ \ \ \ 6381}
\end{array}
$$

$$
\begin{array}{rrl}
a = & 300 & 12,88,81 (300 = a \\
 & \underline{300} & \ \ \ \

that we find the 5 to represent 50, and the 3, 300. A comparison of the above examples will show the agreement and difference between the two modes. The method applies to decimals, the division into periods starting from the decimal point and proceeding in both directions.

SQUARING THE CIRCLE. See QUADRATURE.

SQUARING-UP: a term applied to various methods by which the faces of work are brought into a square position with each other by the use of planes, files, and machine cutters; or to the setting of faces already squared, against the face of a surface plate or marking-off table, preparatory to the scribing of lines and distances.

SQUARROSE, a. *skwŏr'rōs,* or SQUAR'ROUS, a. *-rŭs* [mid. L. *squarrōsus,* covered with scurf or scab]: in *bot.,* covered with projecting parts or jags; having scales, small leaves, or projections spreading widely from the axis on which they are crowded. SQUAR'RULOSE, a. *-ū-lōs,* slightly squarrose.

SQUASH, v. *skwŏsh* [Low Ger. *quasken,* expressing the sound of dabbling in a wet material, or walking with water in the shoes: Ger. *quatschen,* to quash: OF. *esquacher,* to crush something soft]: to bear or press into pulp; to crush into a flat mass: N. anything soft and easily crushed; a sudden fall of a heavy soft body; a shock of soft bodies. SQUASH'ING, imp. SQUASHED, pp. *skwŏsht.* SQUASHY, a. *skwŏsh'ĭ,* like a squash; muddy. SQUASH'INESS, n. *-ĭ-nĕs,* the state of being squashy or soft. SQUISH-SQUASH, the noise made by the feet in walking over swampy ground.

SQUASH, n. *skwŏsh:* properly MUSQUASH (q.v.).

SQUASH, n. *skwŏsh* [N. Amer. Indian, *asq,* raw, green, immature—plu. *asquash*], (*Cucurbita,* order *Cucurbitaceæ*): vegetable belonging to the gourd family (see GOURD), grown extensively in gardens and on truck farms, and in both temperate and tropical regions, though more largely in the United States than elsewhere. It yields best when grown in warm, rich, and moderately dry soils. Different varieties vary greatly in luxuriance of growth, the bush sorts growing nearly erect and the running kinds sending out vines 10 to 15 feet in length. Planting should be in hills 4 feet apart each way for the small sorts to 10 feet for the larger sorts. A liberal quantity of rich compost should be put in each hill and worked into the soil. Planting must be delayed till the ground is dry and warm. Ten or more seeds are to be planted in each hill, but when they have obtained a vigorous start all but three or four plants should be removed. Frequent cultivation should be given. As soon as the leaves appear the plants must be protected from the striped beetle and the Squash-bug (q.v.), by the use of a frame for each hill covered with mosquito-netting,

or by sprinkling the leaves with plaster or wood-ashes. The squash-borer often proves destructive of the running varieties: its effects are counteracted by covering with earth, soon after the vines have commenced to run, the first two or three joints of the plant. The summer sorts of the squash are used in the green state. Winter varieties, if well ripened, gathered before frost, and properly stored, can be kept till late in spring. Varieties differ greatly in color, form, size, and quality, but hybridize very readily with each other and with pumpkins, and can be kept pure only by planting them considerable distances apart. The squash was cultivated by Indians previous to the settlement of this country by white men: it is now very largely grown for the table, and to some extent for feeding to stock; and there are about 50 varieties under cultivation.

SQUASH BUG (*Anasa tristis*): hemipterous insect of family Coreidæ, which destroys squash and pumpkin vines by eating the leaves. Its color is black and its odor extremely offensive. Its eggs are laid in patches on the under side of the leaves. The first brood appears in the n. about July 1, and is soon followed by others. Prevention is secured by covering the plants with mosquito-netting, or by application of plaster or wood-ashes (see SQUASH). Mixing a tablespoonful of kerosene with two quarts of plaster or ashes is said to increase their efficiency. Arsenical poisons are sometimes used.—Another insect (*Diabrotica vittata*), known both as the striped squash-bug and the striped cucumber beetle, also feeds on the leaves and is very destructive: the same preventive measures as for the squash-bag should be used against it.

SQUAT, v. *skwŏt* [imitative of a drop of liquid falling to the ground, then used to signify lying close and flat like a liquid mass: prov. Dan. *squat*, a blot, a drop: prov. Eng. *squot*, to spot with dirt]: to sit or cower down on the hams or heels; to stoop or lie close to escape observation; to settle on new lands without a title; in *OE.*, to bruise or make flat by letting fall: ADJ. sitting on the hams or heels; sitting close to the ground; cowering; short and thick, like an animal cowering: N. in *OE.*, the posture of one who sits on his hams. SQUAT'TING, imp.: ADJ. used for sitting or squatting upon: N. the act of settling upon new lands without a title. SQUAT'TED, pp. SQUAT'TER, n. *-tĕr*, one who squats: in the *United States*, a settler who occupies lands, especially public lands, without just title: in the *Australian colonies*, a name applied to sheep-farmers and cattle-breeders who occupy extensive tracts of land from government at very low rental (see NEW SOUTH WALES, VICTORIA.)

SQUAT'TER: the name given a person who settles on public or new lands without any title. In Australia the sheep-farmers, who occupy the unsettled tracts of land

as sheep-runs under lease from government at a nominal rent, are also called squatters.

SQUATTER SOVEREIGNTY: a term designating the right of occupation acquired through undisturbed possession of public lands for a certain number of years, by unauthorized settlers.

Public lands or public domain belonging either to the nation or individual States, from the necessities of government and the usual operations of capitalists, became an object of speculation, and were accordingly sold from time to time in large tracts to capitalists and speculators, who generally resided at a great distance from the lands thus purchased by them. Their lands being thus entirely out of their view and control, were of course continually intruded upon, and possession taken here and there by emigrants from the more populous towns, who put them under cultivation, and erected houses and buildings upon them for the common purposes of agriculture. These settlers came to be familiarly known as squatters, a name naturally derived from the act of settling upon lands in the manner practised by them. By the lapse of time the mere possession of these settlers, without any legal title to the land, ripened into what they considered to be a right, although the proprietors of the soil were in general wholly ignorant of such occupation of their property. At length, after a long series of years, it became impossible to dispossess them, however wrongful their possession, in its origin, may have been. It is true that the proprietors might, and did institute legal processes, and recovered judgment against the occupants, but the officers of justice could not execute the sentence of the law and dislodge them from their possession. Instances not unfrequently occurred where the officers of justice and the proprietors themselves, or their agents, were shot at, or suffered other acts of violence from the occupants. In this critical exigency, which threatened so much mischief to the public as well as individuals, and which was perhaps exaggerated by those men who wished to avail themselves of the occasion to obtain popularity for political purposes, it was thought necessary to pass laws which were to a great extent similar to the Roman agrarian laws and which deprived the real proprietor of a portion of his rights and transferred them to the wrongful possessor of the lands sold by the public.

Under colonial laws and usages a title to land by mere occupancy could not be acquired by a possession short of 60 years. By one of the first laws promulgated by a State of the republic on the question, the legislature of Massachusetts in 1808 shortened this term to 40 years. So far as it affected those persons who had previously purchased either of the State or of others holding under the State, its operation was manifestly unjust. It compelled the proprietors to relinquish at once their claim to all that portion of their lands which they had been dis-

possessed of for more than 40 years, and which they had purchased at the full value under the faith of the ancient law of 60 years' possession.

This essential change in the legal rights of the proprietors in violation of what they deemed to be the fair intent and meaning of their contracts, caused much excitement and dissatisfaction among them. Generally, it may be said that there evidently was a hardship on both sides; it was not equitable on the one hand, that the proprietor should be deprived of his land, nor on the other that an innocent occupant, who had been suffered to remain in possession for 30 or 40 years, undisturbed by the proprietor, should be suddenly expelled and stripped of the fruits of the labor of a whole life. By way of alleviating the difficulties of the case, it was provided in this law of 1808 agreeably to a well-known principle of the Roman code, that when the proprietor should institute a process to recover his land, the occupant should have a right to claim an allowance for the value of the improvements which he had made upon the lands thus occupied by him, and which were called in the Roman law *meliorantes* or *melioramenta*, and by analogy in the popular language of New England, *betterments, improvements*, which might have been taken to convey the idea of *melioramenta* being already used in New England in the sense of occupation.

In practice the law was more unequal in its operation as regarding the proprietor of the land from another circumstance; for he being usually a non-resident or stranger, and the occupant being an inhabitant of the same territory from which the jury was taken who were to try the question of right between the parties, the proprietor was in the more danger of suffering injustice from the prejudice or hostility of the jury. But here again the law interposed a useful check which was that no person who was interested in a similar question should be a member of the jury.

Notwithstanding the presumable injustice of the law, it remained in operation, and the lapse of time rendered it less and less unequal and injurious in its effects; it became the model of similar laws for all other States of the Union which respectively claimed the right to legislate upon the matter according to local needs.

And from this claim for legislation according to local needs arose the cry of 'popular sovereignty' which became identified with 'squatter sovereignty' in that its adherents, especially from 1847 to 1861 advanced and strenuously advocated the theory that the question of slavery in a State or Territory should be decided by the electorate of the State or Territory and not by Congress. See also LANDS, PUBLIC; PUBLIC DOMAIN.

SQUAW, n. *skwaw* [Amer. Indian, *squa*, a woman: a female; a wife.

SQUAW-BERRY, or SQUAW-HUCKLEBERRY: the

deerberry, genus *Vaccinium stamineum,* a bush native to the eastern part of the United States. The bush rarely grows to any height and the berry is very unsavory. The bush, however, has pretty racemed flowers with white recurved corolla and yellow stamens.

SQUAWFISH: a fish of the genus *Ptyochelus oregonensis,* inhabiting the fresh water bodies in California, and commonly known there as the 'Sacramento pike.' It grows sometimes to be five feet in length and is one of the largest specie of the carp family to be found in American waters.

SQUAWROOT: a fleshy plant, genus *Conopholis americana,* of the order *Orobanchaceæ,* native of the eastern part of the United States. It is generally root-parasitic and found among fallen leaves in oak woods. It is leafless, grows to a height of three to six inches and as large around as a man's thumb. Fleshy scales entirely cover the plant and the flowers are in axils of these scales. The blue cohosh, *Caulophyllum thalictroides,* is in rare instances also called squawroot.

SQUEAK, v. *skwēk* [imitative of a short cry, as *squeal* of a prolonged sound: Ger. *quieken,* to squeak like a pig]: to utter a short shrill cry; to make a sharp disagreeable noise: N. a short acute cry. SQUEAK'ING, imp.: ADJ. crying with a sharp voice; making sharp disagreeable sounds. SQUEAKED, pp. *skwēkt.* SQUEAK'ER, n. *-ėr,* one who squeaks.

SQUEAL, v. *skwēl* [Icel. *squala,* to scream, to cry: Dan. *squalder,* noisy talk (see SQUALL 1 and SQUEAK)]: to cry with a sharp, shrill, continuous sound: N. a sharp shrill sound less momentary than a squeak. SQUEAL'ING, imp.: ADJ. uttering sharp shrill sounds. SQUEALED, pp. *skwēld.*

SQUEAMISH, a. *skwēm'ĭsh* [imitative of a certain degree of choking or oppression: Dan. *quæle,* to oppress: Sw. *qualja,* to make sick; *qualm,* oppressive weather: Norw. *sveim,* a sickness]: sickish at stomach; overnice; scrupulous; easily disgusted. SQUEAM'ISHLY, ad. *-lĭ.* SQUEAM'ISHNESS, n. *-nĕs,* the state of being squeamish; fastidiousness.—SYN. of squeamish'; fastidious; nice; dainty.

SQUEEGEE, n. *skwē-je'* [from *squeege,* vulgar corruption of *squeeze*]: a scrubber, consisting of a plate of guttapercha at the end of a handle, used for cleaning the decks of ships, foot-pavements, etc.; written also SQUILLAGEE and SQUILGEE.

SQUEEZE, v. *skwēz* [AS. *cwysan,* to squeeze, to crush: Low Ger. *quetsen;* Ger. *quetschen,* to squeeze]: to press between two bodies; to embrace closely; to oppress by extortion; to crowd closely together; to press: N. the act of one who squeezes; pressure between bodies. SQUEEZ'ING, imp.: N. the act of compressing; oppression; in *plu.,*

the produce of squeezing; dregs. SQUEEZED, pp. *skwēzd.* SQUEEZ'ABLE, a. *-ă-bl,* admitting of being squeezed. To SQUEEZE OUT, to force out by pressure, as a liquid. To SQUEEZE THROUGH, to pass through by pressing.—SYN. of 'squeeze, v.': to hug; press; pinch; gripe; crush; crowd; oppress; clasp; bruise; pound; compress.

SQUELCH, v. *skwĕlsh* [imitative of the sound produced by the fall of soft bodies]: to crush: N. a flat heavy fall. SQUELCH'ING, imp. SQUELCHED, pp. *skwĕlsht.*

SQUETEAGUE, n. *skwē-tēg'* [etym. doubt.], (*Otolithus regalis*): fish found in Long Island Sound and the Gulf of St. Lawrence. The flesh is wholesome and well-flavored, but as it soon grows soft does not rank high in market. The air-bladder makes excellent isinglass. It is a voracious fish and bites readily, but its mouth is easily torn, whence it is often called WEAK-FISH.

SQUIB, n. *skwĭb* [Icel. *svipa,* to flash, to dart; *svipr,* a swift movement, twinkling]: a firework which, after ignition, bursts with a loud noise; a light witty composition reflecting on another, less sarcastic than a lampoon; in *OE.,* a petty fellow; one of the lower functionaries of the old gaming-houses: V. in *Amer.,* to utter sarcastic expressions. SQUIB'BING, imp. SQUIBBED, pp. *skwĭbd.*

SQUID, n. *skwĭd* [a corruption of SQUIRT]: any ten-armed cuttlefish not a sepia or spirula. The squids are divisible into several groups, and range in size from less than an inch (*Idiosepion*) to 75 feet or more in length, when the arms are outstretched. They are found in all oceans, and most of the genera are nearly cosmopolitan. The small families *Sepiadariidæ* and *Idiosepiidæ* are confined to the Pacific, and the *Chiroteuthidæ* to the Atlantic, but the others are practically world-wide in their distribution and pelagic as well littoral in range. Together these families form the dibranchiate suborder *Decapoda.* Most of the squids belong to the shore-haunting *Loliginidæ* or else to the pelagic family *Ommastrephidæ.* In both the gladius, 'pen,' or 'cuttlebone,' is long and chitinous instead of broad and calcareous as in the sepias proper. The old European names 'calamary' or 'pen-and-ink fish' refer to the pen-shape of this internal support, which is nearly or quite as long as the back; and to the reservoir of inky dye which they discharge when alarmed. In the *Loliginidæ* it is flat, pointed in front, and has the shaft keeled on the ventral side; in the *Ommastrephidæ,* it is horny, narrow, and terminates in a hollow cone at the posterior end. There are many species, both existing and fossil.

The common squid of the North Atlantic coast of the United States is *Loligo pealii,* which after several years of slow growth become 12 to 18 inches long. The color when living is very changeable, owing to the alternate contraction and expansion of the color-vesicles (chromatophores), but red and brown tints prevail, and the general

effect is great beauty. These squids lay their eggs in midsummer in large bunches of long gelatinous capsules on shelly and weedy bottoms and along rocky coasts. This species is often found in great numbers in summer close to the shore of Maine and northward, and many of them are stranded on the beaches. All the squids are caught by sea fishermen to use as bait.

The 'flying squids' of the genus *Ommastrephes,* are so named from their habit of leaping from the sea, sometimes to such a height as to land them upon the decks of vessels. They are met with chiefly far from land; but one small species (*O. illecebrosa*) is frequently seen in large companies near the New England coast. Verrill describes its attack upon schools of small fishes in which it resembles squids generally. All the species are fish-eaters, and are themselves the prey of larger fishes, and of porpoises and the various whales, turtles, etc., of the sea. 'In attacking the mackerel,' says Verrill, 'they would suddenly dart backward among the fish with the velocity of an arrow, and as suddenly turn obliquely to the right or left and seize a fish, which was almost immediately killed by a bite in the back of the neck with the sharp beaks . . . cutting out a triangular piece of flesh.' They are mainly nocturnal in activity.

To this family belong the 'giant squids' of the genus *Architeuthis,* which occur in Arctic and sub-Arctic seas, and are occasionally stranded on the shores of Norway and Greenland, or found in part in the stomachs of captured sperm whales, for which they form an important food-resource. These giants, which probably reach a great age, and frequently exceed 50 feet in length, including the arms, have such strength that they could drag down a large boat.

Consult; Cook, *Mollusca* (London, 1895); Kingsley, *Standard Natural History,* Vol. I. (Boston, 1885); Verrill, *Invertebrates of Vineyard Sound* (Washington, 1874).

SQUIER, *skwīr,* EPHRAIM GEORGE, LL.D.: 1821, June 17—1888, Apr. 17; b. Bethlehem, N. Y.: author and archeologist. In youth he was a school teacher and engineer; 1840 was editor of *The Mechanic,* at Albany; 1843, of the Hartford (Conn.) *Journal;* and 1844, of the *Scioto* (Ohio) *Gazette.* His attention being attracted to the antiquities of the Scioto valley, he made exploration of similar monuments through the Mississippi valley; an account of which was published 1848, forming Vol. I. of *Smithsonian Contributions to Knowledge.* He made similar explorations in N. Y. and Conn.; and being appointed *chargé d'affaires* to Guatemala and other states of Central America 1849, he used his official position in making extensive geographical and archeological explorations. He was honored 1851 with the gold medal of the French Geog. Soc. Returning to Central America (1853), he surveyed a railway route through Honduras, and drew

up the treaty between that country and England for the retrocession of the Bay Islands. While in Peru as U. S. commissioner (1863-65) he made exhaustive researches concerning the remains of the Incas, and became recognized as the principal authority on American Indian archæology. He was afterward chief editor of Frank Leslie's publications and in 1871 was active in organizing the American Anthropological Society, of which he was the first president. A severe illness in 1874 incapacitated him for further research, though he recovered sufficiently to complete the revision of his work on Peru.—Among his works are: *Nicaragua: its People, Scenery, Ancient Monuments, and Proposed Inter-oceanic Canal* (1852); *The Serpent Symbol, or Worship of the Reciprocal principles of Nature in America* (1852); *Notes on Central America* (1854); *Waikna, or Adventures on the Mosquito Shore* (1855); *Question Anglo-Americaine* (1856); *The States of Central America* (1857); Report of the Honduras Survey (1859); a work on Tropical Fibres (1861); *Honduras* (1870); *Peru* (1876); articles in *Encyc. Brit.*

SQUILL, n. *skwĭl* [F. *squille;* Sp. *esquila;* L. *scilla;* Gr. *skilla,* the sea-onion]: lily-like bulbous-rooted plant used in medicine; nearly allied to Hyacinths, Onions, etc., and having a spreading perianth, stamens shorter than the perianth, smooth filaments, a 3-parted ovary, and a 3-cornered capsule with three many-seeded cells. Gardeners apply the name Squill also to various species of Scilla. The Officinal Squill (*Scilla maritima*), native of the sandy shores of the Mediterranean, has a scape two to four ft. high, with raceme of many whitish flowers, and large leaves. The bulb is of the size of a man's fist, sometimes of a child's head, and contains a viscid juice so acrid as to blister the fingers if much handled; while the vapor arising from it irritates the nose and eyes. Squill was used in medicine by the ancients. Its use is contraindicated if inflammatory symptoms are present. Its dose as diuretic is one to three grains of the powdered bulb, or about 20 minims of the tincture. As expectorant, the dose of the powdered squill should not exceed one grain, repeated several times daily.

Various species of Squill are planted for ornament. *S. bifolia* has rich blue flowers early in the season. The Spanish Squill has large flowers of light blue; the Italian is pale blue with bright blue stamens; the Peruvian has white stamens; and the Siberian is of porcelain blue. An American species, *F. Fraseri,* is called Wild Squill or Wild Hyacinth; it is found from O. w. and s.w. and has pale blue flowers.

SQUIL'LA, *skwĭl'la:* genus of crustaceans, of order *Stomapoda,* type of a family, *Squillidæ,* to which the names *Mantis Crab, Mantis Shrimp,* and *Sea-mantis* are popularly given, from the strong general resemblance to insects of genus *Mantis* (q.v.). The form is elongated; the carapace covers only the anterior part of the thorax,

the latter part of which is formed of rings like the abdomen; the eyes are on stalks; the claws are very large, and furnished with spines, forming powerful instruments of prehension; the tail is expanded into a broad fin. The species are numerous, and mostly inhabit tropical seas. A species about seven inches long, *S. mantis*, is found in the Mediterranean. The *Squillæ* are extremely active, and very bold and voracious.

SQUINCH, *skwĭnch:* small arches or corbelled courses across the angles of square towers, to bring in the form to carry an octagonal spire, lantern, etc.: see PENDENTIVE.

SQUINT, v. *skwĭnt* [F. *guigner,* to wink or aim with one eye: Dut. *schuinte,* a slope]: to look or see obliquely; to have the eyes differently directed: N. a defect of vision (see SQUINTING): in *arch.,* oblique narrow opening, generally about 2 ft. wide, in the inner walls of many old churches, designed to afford a view of the high altar to those at the sides in the aisles: ADJ. looking obliquely; not having the eyes both turned in the same direction. SQUINT'ING, imp.: N. the act or habit of looking obliquely. SQUINT'ED, pp. SQUINT'INGLY, ad. *-lĭ.* SQUINT-EYED, a. having eyes that squint; indirect; malignant. SQUINY, v. *skwĭn'ĭ,* in *OE.,* to look asquint. SQUIN-YING, imp. SQUINIED, pp. *skwĭn'ĭd.*

SQUINT'ING, or STRABIS'MUS, defect of vision, which may be defined as a lack of parallelism in the visual axes, when the patient endeavors to direct both eyes to an object at the same time. The squint is said to be *convergent* when the eye or eyes are directed toward the nose, and *divergent* when they are directed toward the temple; and is termed *single* or *double* according as one eye or both are displaced. The divergent form is comparatively rare, except in consequence of prolonged loss of sight of one eye. The causes are various. Intestinal irritation, such as the presence of worms, will often induce it temporarily in children. In other cases it may be traced to the temporary cerebral irritation produced by teething; and it is a very common symptom in hydrocephalus and other serious head-affections. Among other causes are a lack of equal normal visual power in both eyes, in extreme short-sight. If the squint is only temporary, and possibly arises from intestinal irritation, the bowels must be well cleared out, and tonics subsequently given. If due to some peculiarity in the visual focus of the eyes, it may be removed by judicious use of glasses. In every case ophthalmoscopic examination is the first duty of the surgeon; and he should also take all means to ascertain that no organic disease exists in the brain or orbital nerves; and that there is no tumor in the orbit, mechanically impeding the movements of the eye. The surgical operation for cure consists in the division of the muscle which, by permanently drawing the eye inward or outward, and overpowering its antagonistic muscle, induces the deformity.

SQUIRE, n. *skwīr* [abbreviated form of ESQUIRE, which see]: popular abbreviation of *Esquire* (q v.), usually applied in England to a landed gentleman by his tenantry and others: an attendant on a noble warrior: in *OE.*, an attendant at court. In some rural parts of the United States, S. is a familiar prefix to names of magistrates, and often of lawyers, etc. SQUIREARCH, n. *skwīr ärk*, a member of the squirearchy. SQUIRE'ARCHY, n. *-är-kĭ* [Gr. *archē*, sovereignty, rule]: in England, term applied to country gentlemen collectively. SQUIRE'LING, n. *skwīr'lĭng*, a small or young squire, in contempt.

SQUIRM, v. *skwėrm* [perhaps connected with WORM]: to writhe or wriggle, like a worm.

SQUIRREL, n. *skwėr'rĕl* [OF. *escurel*—from L. *sciūrus*; Gr. *skiou'ros*, a squirrel, a shadow-tail—from Gr. *skiā*, shade; *oura*, a tail: F. *écureuil*, a squirrel], (*Sciurus*): Linnæan genus of rodent quadrupeds, now the family *Sciuridæ*. They belong to the section of Rodentia having perfect clavicles, and are further characterized by a long bushy tail; the fore-paws furnished with four toes, which have curved claws, and a tubercular thumb; the hind-legs long, their feet with five toes; two incisors in each jaw; four molar teeth on each side in each jaw, simple, with tuberculous crowns, and a fifth in the front of the upper jaw, which soon falls out. Most of the species commonly carry the tail curved over the body, whence the Greek name *Skiouros*, of which the Eng. *squirrel* is a corruption. The species are numerous, and are found in almost all parts of the world, except Australia; some inhabiting temperate and even cold regions, while some belong to tropical countries. Squirrels are very active and agile creatures, at once shy and pert, very adroit in hiding themselves on the appearance of danger, but resembling monkeys in inquisitive curiosity. They inhabit woods, and spend their lives mostly in trees, which they climb with wonderful agility, running along the branches, and leaping from tree to tree. Their running is a kind of bounding, and the tail is then stretched out, as it is also in their leaps from branch to branch, often to great distances. The true squirrels resemble the Flying S. (q.v.) in spreading out their limbs and tail to the utmost in leaping, particularly when they descend from a high branch to the ground; and they thus leap from a great height without injury. Some species, however, seldom ascend trees, but burrow in the ground, and are further distinguished by having cheek-pouches, while the tail is shorter than in the tree-squirrels, and its hair not so distinctly arranged in two lateral rows. These *Ground-squirrels* form the genus *Tamias*. All the squirrels feed on fruits and seeds, the young shoots of trees, and such vegetable substances; though they sometimes vary their diet by plundering birds' nests, and not only sucking eggs, but devouring young birds: they are fond also of the larvæ of insects. In eating, they often sit erect, and hold the food in their fore-paws. The hardest nut presents no difficulty to their sharp strong teeth. Many of the species, probably

all those of temperate and cold climates, lay up stores for winter.—The COMMON S. (*S. vulgaris*) of Europe is a beautiful little animal, brownish red on upper parts, white beneath; the color changes more or less in winter to a grayish brown, and in n. countries to gray. It is widely distributed over northern parts of the old world. The winter hoards of the S. are usually in holes in the ground about the roots of trees—the same pair of squirrels having often a number of these hoards. The seeds of firs form a large part of the winter-food of squirrels.—Another European species is the ALPINE S. (*S. alpinus*), native of the Alps and Pyrenees, about the same size with the Common S., deep brown, speckled with yellowish white.—N. America is rich in species and varieties of S. J. A. Allen (*Rodentia*, U. S. Geol. Survey, 1877) describes 16 species and 13 varieties of *Sciurus* and *Tamias*, besides 11 species and 7 varieties of *Spermophilus*, and two of *Sciuropterus*—total 49. Of *Sciurus* there are the Chickaree, or Red or Pine S. (*S. hudsonius*), e. of the Rocky Mts.; the upper side of the tail with hairs rusty at base. The three varieties, their English names Latinized in the scientific, agree with it in having a narrow black lateral line, and all are found in the Rocky Mts., the second in Wash. also; they are: Fremont's, tail-hairs gray at base; Richardson's, the same dark reddish brown; and Douglass' or Oregon Red S., body fulvous beneath. *S. Carolinensis* is the Southern Gray S., rarely black, and, when gray, the back brownish; and its variety *leucotis*, the Northern Gray S., Canada to La., larger, with more restricted brownish area; it is, or was, often wholly black, but this melanic variety has offered too good a mark for boys' guns, and is in many places exterminated. The Yucatan Gray S. is the smallest, and plain gray. Abert's S., of Colo. to Arizona, has a dorsal band of bright chestnut. The Fox S., with absurd regard to priority, is named *S. niger* (one of its varieties having been so named 1743) instead of *vulpinus* (1788), which latter well designates the foxy color more or less present in all its varieties. These are the Southern Fox S. (var. *niger*), color variable, often dusky, but nose and ears white; the Northern Fox S. (var. *cinereus*), Me. to Va., similar, without the white; and the Western Fox S. (var. *ludovicianus*), with much rufous color. The California Gray S. (*S. fossor*), Or. to Lower Cal., has the tail black, washed with white. Mexican species are the Varied S. *S. boothiæ*), deep brownish red beneath; the Golden-bellied (*S. leucops*), golden-yellow, varying to white, beneath; the Red-bellied (*S. aureogaster*), reddish orange below; the Orizaba S. (*S. tephrogaster*), olivaceous brown above; Collie's S., clear gray above; the Fire-bellied S. (*S. hypopyrrhus*), narrow-tailed and coarse-haired; of these the third extends to Guatemala, and the fourth to S. America. Gerard's S., dark reddish to fiery orange beneath, is a Central and S. Amer. species; and *S. variabilis*, above black varied with yellow, is S. American. Of the genus *Tamias* are the common Chipmunk or Striped S. (*T. striatus*), Canada and U. S. to Dak. and La., the back with two

white and five black stripes; Harris' Chipmunk, New Mex. to Cal., lacking the black stripes; the large S. *Lateralis*, Black Hills to Sierra Nevada and Cascade ranges, the two white stripes each bordered with black; and *T. asiaticus*, with four white and five black stripes, some of its forms occurring in n. Asia and e. Europe, and five varieties in N. Amer.—viz.: the Northern Chipmunk (var. *borealis*), from n.e. Europe through n. Asia to near the U. S., and having the sides fulvous; the Rocky Mt. Chipmunk (var. *quadrivittatus*), middle and s. Rocky Mts., the sides bright. rusty or golden; the Pale Chipmunk (var. *pallidus*), dry western plains and Great Basin; the Gila Chipmunk (var. *dorsalis*), more southerly, pale, and stripes obsolete; and Townsend's Chipmunk, n. Cal. to Brit. Columbia, large, with strongly marked dark stripes. Of the genus *Spermophilus*. *S. grammarus*, Colo. to Mex., is finely mottled above, and the tail below has three lengthwise bands of black; it has a s. Cal. variety, and one in n. Cal. and w. Or., both known as Ground-squirrel. *S. empetra* is comparatively large, with squarish white spots above; it has Kodiak Island and Brit. Columbia varieties. *S. Richardsoni*, N. Dak. and northern plains, is smaller, with mixed colors, and has a Dak. to Wash. variety. *S. mollis*, n. Utah and w., has no ear projection. *S. spilosoma*, Tex. and n. Mex., has spots, but not in rows. *S. obsoletus*, Black Hills and Great Basin, is similar, but yellowish brown, not reddish, above. *S. tereticaudus* of s. Cal. is described in its name. *S. Mexicanus* has white spots in 9–11 rows. The Leopard S. of the prairies (*S tridecemlineatus*) has 6–8 light lines alternating with 5–7 rows of light spots, and there is a var. *pallidus* on the dry plains; the gray-headed S. (*S. Franklini*), Mo. to lat. 64°, is the large gray ground-squirrel of the prairies; and the Annulated-tailed S. of w. Mex. is described in its name. Of the species *Sciuropterus volucella*, there are two varieties, the Northern Flying S., and the Southern, the latter smaller, tail less dusky, and the body more yellowish above.—For the so-called Barking Squirrel, see PRAIRIE DOG

The fur of some American squirrels is an article of commerce: it is one of the cheap furs.

SQUIRT, v. *skwêrt* [Norw. *squittra* to spout, to splash: Sw. *squätta*, to squirt]: to eject from a narrow pipe or orifice, as water; to throw out in a stream with sudden jerks N. a small instr. by which a liquid may be thrown out in sudden streams; a syringe. SQUIRT'ING, imp. SQUIRT'ED, pp. SQUIRTING CUCUMBER, a plant, the fruit of which, when nearly ripe, separates suddenly from its stalk, and at the same time ejects its juice and seeds; the *Momor'dica elatĕrĭum*, or *Ecbal'lĭum agres'tĕ*, ord. *Cucurbĭtăcĕæ*.

SQUITCH: see COUCH GRASS.

S'RÂDDHA, *srâd'hâ* [Skr. *s'raddhâ*, faith, belief]. name of the funeral ceremony of the Hindus, in which balls of food, and water, are offered to the deceased ancestors of the sacrificer, or to the *Pitr'is* or manes collectively. S. is supposed necessary to secure the ascent and

residence of the souls of the deceased in a world appropriated to the manes. But it is observed also on occasions of rejoicing; hence various S'râddhâs are enumerated—*constant, occasional, voluntary,* etc. The presentation of the ball of food to the deceased, and to his progenitors in both lines, is the office of the nearest male relative, *and is the test and title of his claim to the inheritance.*—See H. H. Wilson's *Glossary of Judicial and Revenue Terms* (Lond. 1855).

S'RÂVAKA, *srâ'va-ka* [from Skr. *s'ru,* to hear]: name of the disciples of Buddha, who, through the 'hearing' of his doctrine, and by practicing the four great Buddhistic truths, attain the qualification of an Arhat, or Buddhist saint. From among the number of the disciples of Buddha, 80 are called the *Mahâs'râvakas,* or the great S'râvakas.

SRINAGAR, or SERINAGUR (signifying 'Holy City'): capital of Cashmere, or Kashmir, in the beautiful valley of the same name, on the Jehlam River, occupies a lofty position, about 5,000 feet above sea-level. It extends about two miles along the river, which, with its windings, and the numerous vessels plying upon it, has a very picturesque appearance, but the surrounding low marshes make the climate unhealthful. It is poorly fortified, although commanding a site which permits of making it a great stronghold. Its wooden buildings are often destroyed by fire, and few of them deserve notice. The Jama Musjid, or Great Mosque, celebrated mostly for its enormous dimensions, has a rude dome and spire; another mosque of wood is curiously Chinese in character. There are numerous gardens, and a beautiful lake east of the town marks the scene of Moore's *Lalla Rookh.* Srinagar manufactures attar of roses, shaws, leather, paper, firearms, etc. Pop. (1901) 122,536.

S'RUTI [from Skr. *s'ru,* hear; hence, literally, the hearing, or that which is heard]: in Sanskrit literature, technical term for all those works considered to have been revealed by a deity. See VEDA.

SS, *ĕs'ĕz,* COLLAR OF: collar composed of a series of the letter S in gold, either linked together or set in close order, on a blue and white ribbon, with the ends connected by two buckles and a trefoil shaped link.

ST. (preceding a name): abbreviation for SAINT.

STAB, v. *stăb* [Gael, *stob,* to thust, to drive into the ground; *stob,* a pointed iron: Icel. *stappa,* to pound, to stamp: L. *stipārĕ,* to stuff, to cram: Gr. *steibō,* I stamp, I tread]: to give a sharp abrupt thrust with a pointed weapon; to give a mortal wound; hence, to injure secretly by malicious falsehoods: N. the thrust of a pointed weapon; an injury done secretly. STAB'BING, imp.: N. act of one who stabs. STABBED, pp. *stăbd.* STAB'BER, n. *-bĕr,* one who or that which stabs. TO STAB AT, to thrust a pointed weapon at.

STABAT MATER ('The Mother stood'), first words, and title of a celebrated hymn on the Crucifixion; its authorship is assigned to Jacopone da Todi, a disciple of Saint Francis de Assisi, in the 13th century. It has been set to music by several of the great composers, including Palestrina, Pergolesi, Haydn, Rossini, and Dvorak. The composition of Pergolesi, for two voices with accompaniment, is the most celebrated, but that of Rossini is the most popular in the concert room. The hymn as given in the *Breviarium Romanum* office of the festival of the Seven Dolors of the Blessed Virgin Mary (Friday after Passion Sunday) is as follows:

Stabat mater dolorosa,
Juxta crucem lacrymosa,
  Dum pendebat filius.
Cujus animam gementem,
Contristatam et dolentem
  Pertransivit gladius.
O quam tristis et afflicta
Fuit illa benedicta
  Mater Unigeniti.
Quæ mœrebat et dolebat
Pia mater, dum videbat
  Nati pœnas inclyti.
Quis est homo qui non fleret
Christi matrem si videret
  In tanto supplicio?
Quis non posset contristari,
Piam matrem contemplari
  Dolentem cum filio.
Pro peccatis suæ gentis
Vidit Jesum in tormentis,
  Et flagellis subditum;
Vidit suum dulcem natum
Moriendo desolatum,
  Dum emisit spiritum.
Eia mater, fons amoris,
Me sentire vim doloris
  Fac, ut tecum lugeam.
Fac ut ardeat cor meum
In amando Christum Deum
  Ut illi complaceam.
Sancta mater, istud agas,
Crucifixi fige plagas
  Cordi meo valide.
Tui Nati vulnerati,
Tam dignati pro me pati,
  Pœnas mecum divide.
Fac me tecum pie flere,
Crucifixo condolere,
  Donec ego vixero.
Juxta crucem tecum stare,
Et me tibi sociare,
  In planctu desidero.
Virgo virginum præclara,
Mihi jam non sis amara,
  Fac me tecum plangere;
Fac ut portem Christi mortem,
Passionis fac consortem
  Et plagas recolere.
Fac me plagis vulnerari,
Fac me cruce inebriari,
  Et cruore filii.
Flammis ne urar accensus,
Per'te, Virgo, sim defensus
  In die judicii.
Fac me cruce custodiri,
Morte Christi præmuniri,

STABILITY—INSTABILITY.

Confoveri gratia.
Quando corpus morietur,
Fac ut animæ donetur
Paradisi gloria.

STABIL'ITY AND INSTABIL'ITY: terms denoting different conditions of equilibrium. When a body rests upon a surface, in such a manner that a vertical from its center of gravity falls within the largest polygon which can be formed by joining the various points of contact of base and surface, it will stand; but if the contrary is the case, it will fall, unless extraneously supported. If the base of the body be a plane, and the supporting surface convex, or *vice versâ*, or if both base and surface be convex, there will be only one point of support, and if the body be at rest, its center of gravity must be vertically over the point of contact. Should a body so placed receive a slight impulse, it will either oscillate to and fro, ultimately returning to its original position; or will remove further and further from its original position, showing a tendency not to return; or will appear indifferent to any one position. In the first case, the

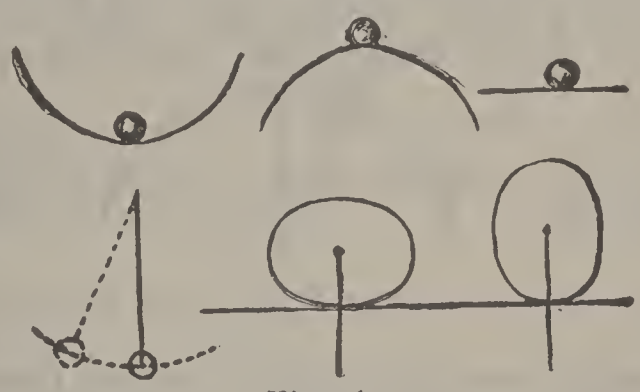


Fig. 1.

body is said to be in *stable*, in the second case, in *unstable*, and in the third, in *neutral* equilibrium (see STATICS). Fig. 1 shows various illustrations of these three species. It will appear at once that the predetermining cause of equilibrium, being of one rather than of another of these species, is the tendency of the center of gravity of every body to seek a lower position; and the illustrations show that in stable equilibrium the center of gravity of the body may, and in unstable equilibrium may not, attain a lower position, while in neutral equilibrium its position continues unaltered. In illustration of the mode in which the species of equilibrium possessed by a body which has received a slight impulse is determined, let us take the case of a body with a spherical base resting upon a spherical surface (Fig. 2); let S and O be the centers of the spherical surfaces respectively, and let A be their point of contact (the center of gravity being consequently in the line SA, or in it produced toward S, and after displacement, in the line S′ A′, produced if necessary), let the new position of S, after the body has been slightly displaced, be S′, and the new point

of contact B; join OS, OS′, S′A′, and draw BD vertically, that is, parallel to OC. Then A′D : A′S′ :: OB : OS′, or $A'D = \frac{A'S' \times OB}{OS'}$, that is, A′D = the product of the radii of the two surfaces divided by their sum. Now, should the centre of gravity of the displaced body fall between D and A′, it will have a moment round B tending to restore the body to its former position (*stable equilibrium*); should the centre of gravity be beyond D from A′, its moment round B will tend to increase the displacement (*unstable equilibrium*); while, if it fall in the line BD, it will still be above the point of contact, as it was at first, and there will be no tendency either to return to, or to

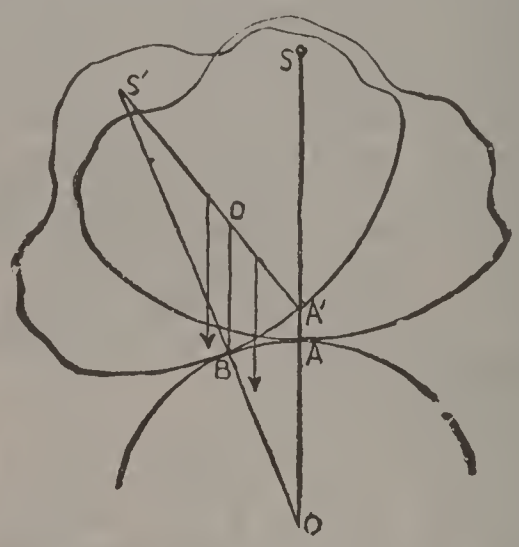


Fig. 2.

move further from, the original position (*neutral equilibrium*). These conditions may be briefly expressed by the following formulæ, in which R is the radius of the supporting surface, r of the spherical base of the body, and X the distance of the centre of gravity from the point A; when equilibrium is stable, X is less than $\frac{R \times r}{R + r}$; when unstable, X is greater than $\frac{R \times r}{R + r}$; and when neutral, $X = \frac{R \times r}{R + r}$ From these formulæ, the conditions of equilibrium of a body, with a spherical base on a plane surface, can be at once deduced by making $R = \infty$, the three species of equilibrium being then represented in order by X less than r, X greater than r, and $X = r$; the simplest illustrations of these being respectively a segment of a sphere, a tall cone on a spherical base, and a sphere.

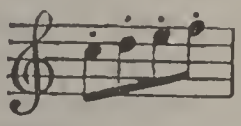
STABLE, a. *stā′bl* [F. *stable*, stable—from L. *stabĭlĭs*, that stands fast or firm—from *sto*, I stand: It. *stabile*]: firmly established; fixed in resolution or conduct; durable; not fickle. STA′BLY, ad. *-blĭ*. STA′BLENESS, n. *-bl-nĕs*, or STABILITY, n. *stă-bĭl′ĭ-tĭ* [F. *stabilité*]: strength to stand without being moved; firmness; immovability; strength of resolution or purpose; steadiness; constancy. STABLE

EQUILIBRIUM, the property of a body of returning to its original position when disturbed (see STABILITY AND INSTABILITY: STATICS).—SYN. of 'stable': strong; durable; fixed; established; steady; constant; immovable; firm; abiding.

STABLE, n. *stā'bl* [OF. *estable*, a stable—from L. *stabŭlum*, a standing-place, a stable—from *sto*, I stand]: a stand or house for horses: V. to put into or keep in a stable; to dwell in a stable. STA'BLING, imp. *-blĭng:* N. accommodation or houses for the shelter of horses. STABLED, pp. *stā'bld.* STA'BLEMAN, n. one who attends to stables and the horses in them. STA'BLER, n. *-blĕr*, one who stables horses. STABLE-BOY, a boy who waits on horses in a stable.

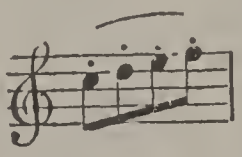
STABLISH, v. *stăb'lĭsh* [for ESTABLISH, which see]: in *OE.*, to establish; to fix; to settle.

STACCATO, ad. *stăk-kâ'tō* [It. detached]: in music, a term implying a detached, abrupt mode of performance. A certain amount of time is subtracted from the proper value of any note played S., and a rest substituted. A dot placed over a note indicates that it is to be played S:



A dash implies a greater degree of S.:

and a very slight degree of S. is expressed by uniting the dot with the slur:



; the slur being the sign of a *legato* expression, the converse of staccato.

STACHYS, *stā'kĭs:* genus of plants of nat. order *Labiatæ* (*Lamiaceæ* of Lindley), containing a great number of species (about 160 known), mostly European, having a ten-ribbed calyx, with five nearly equal teeth, the upper lip of the corolla entire, and the lower lip three-lobed. *S. sylvatica* is very common in shady places, a coarse herbaceous plant, sometimes called *Hedge-nettle*, with stem 2–3 ft. high. *S. palustris* is another common species, growing in moist places, and sometimes a very troublesome weed in meadows: it was formerly used as a vulnerary, and has therefore the English name *Woundwort.* Several species are frequent in flower-gardens.—*S. palustris* is common in the U. S., of many varieties, rough or smooth. Another species is *S. hyssopifolia*, 1 ft. high, growing in wet sandy soil, with linear leaves. Cultivated for ornament are *S. lanata* from Europe, with low, tufted, mullein-like leaves, and purple flowers, and the Scarlet S. (*S. coccinea*) from Mexico.

An important Japanese species is *S. tuberifera*, a tuberiferous plant, with many properties resembling those of

the potato it is a native of Japan. The mode of cultivation is that of the potato. The tubers found in a single hill are often more than 100, though they are smaller than average potato tubers. Chemical analysis of the tubers gives the following results:

Water	78·33	per cent.
Protein	1·50	"
Amide	1·67	"
Fat	0·18	"
Carbon hydrate (galactine)	16·57	"
Cellulose	0·73	"
Ash	1·02	"

There is neither starch nor sugar, but the substance *galactine*, intermediate between them. The tubers have agreeable taste when boiled in salt water and served with butter and parsley sauce. Sliced and fried in butter they are said to be delicious: the taste at first seems like that of the sweet potato, but one soon detects a fine piquant flavor. They do not need to be peeled. They are kept in the ground as late as possible, and when dug are packed in sand till required for use. Exposed to air they shrink and lose their mother-of-pearl-like color. They are not injured by frost.

STACK, n. *stăk* [Icel. *stakka*, a stump; *stakkr*, a stack or projecting heap: Sw. *stack;* Dan. *stak*, a stack]: a large conical heap of corn in the straw, thatched on the top; a large pile of hay, straw, or wood; a number of chimneys standing together; in *geol.*, a pillar-like rock standing separate from a line of cliffs: V. to lay up in a large pile or heap. STACK'ING, imp. STACKED, pp. *stăkt.* STACK-YARD, the space of ground where grain in the straw is piled in large heaps or stacks. STACK OF ARMS, firearms placed together so as to form a conical heap, with their ends resting on the ground.

STACTE, n. *stăk'tē* [Gr. *staktē*, myrrh-oil]: a fatty and very odoriferous liquid, being a kind of myrrh.

STADDLE, n. *stăd'dl*, or STADLE, n. *stăd'l* [AS. *stæthel*, a foundation: Icel. *stada*, standing: Dan. *stade*, station, a standing]: in *OE.*, a support; the support or platform of a stack; a young tree left standing when the underwood is cut down: V. to leave staddles when a wood is cut down. STAD'DLING, imp. *-dlĭng.* STADDLED, pp. *stăd'dld.* STADDLE-ROOF, the roof or covering of a stack.

STADE, *stä'dĕh:* small and very ancient town, formerly fortified, in Prussian Hanover, near the mouth of the Schwinge, a tributary of the Elbe. Pop. (1880) 9,700.

The *Stade Dues* were a toll or duty formerly charged by the Hanoverian govt. on all merchandise carried up the Elbe to Hamburg. The original duties, regulated by treaty 1691, were comparatively light, but were gradually increased till they brought to Hanover a revenue of about $200,000. After several modifications 1844 and 54, this vexatious toll was finally abolished 1861, Hanover receiving a compensation equivalent to about $150,000 annually; of which Great Britain paid one-third, another third was

contributed by Hamburg, and the remaining third divided proportionally among the other countries that traded to the Elbe.

STADHOLDER, *stăd'hōld-ĕr* [Dutch *stadhouder*, stead-holder or *locum tenens*—from *stad*, place; *houder*, holder]: literally, stead-holder, lieutenant, representative.—In usage, S. designates a lieut.gov., especially of the Netherlands (for the king of Spain); afterward, governor, head of the state, chief magistrate (of the United Provinces). In the 16th c., when the tyranny of Ferdinand, Duke of Alva, gov. under Philip II., drove the principal towns of the Netherlands into revolt, they chose William, Prince of Orange, for their gov.; and to make it plain that the revolt was not against Philip, but against Alva, they conferred on William no higher title than that of Stadhouder. On the assassination of William 1584, the provinces of Holland, Zeeland, and Utrecht, agreeing to have one stadhouder, appointed Maurice of Nassau to that office, which came tacitly to be regarded hereditary. The stadhouderate thus instituted was considered to be at an end or in abeyance on the extinction of the line of William I., by the death of William III. However, on the triumph of the Orange party over the republican 1747, William IV., descended from a collateral branch of the House of Nassau, was proclaimed stadhouder, capt.gen., and admiral-in-chief of the Seven United Provinces, those dignities being made hereditary in his family. His son, William V., seventh stadhouder, was driven from his country by the French 1795, and resigned his office 1802; since which time, the stadhouderate has never been revived, the Netherlands having, at the Congress of Vienna, been formed into a kingdom.

STADIUM, n. *stā'dĭ-ŭm* [L. *stadĭum;* Gr. *stadĭŏn*]: ancient measure of length, consisting of 125 anc. paces or 625 Roman ft., equal to 606 ft. 9 inches English; the eighth part of a Roman mile.—The stadium originally was the space of ground set apart for foot-races and all other gymnastic contests except horse-racing, which were wont to be celebrated at Olympia and other places in Greece; the horse and chariot races being held in the *Hippodrome* (q.v.). The S. was of the same form as the hippodrome and the arrangement of the spectators was similar. The distance between the starting-point and the goal was, in the Olympic stadium, about 600 Greek ft.; and the stadia of other places adopted the dimensions of that at Olympia. This distance of 600 Greek ft. was adopted as the chief Greek measure of length, and called a *stadium*.—S. is used to denote also the stage of a disease.

STADTHOLDER, n. *stăt'hōld-ĕr:* perverted form of STADHOLDER (q.v.).

STAËL-HOLSTEIN, *stä-ĕl ŭl-stăng'*, ANNE LOUISE GERMAINE NECKER, Baronne DE: 1766, Apr. 22—1817, July 14; b. Paris; daughter of the celebrated Necker (q.v.), finance minister of Louis XVI. in the times immediately preceding the Revolution. Her mother was a woman of severe character, and from her earliest years subjected her to rigorous discipline. The daughter, in consequence, had no very warm attachment for her; but for her father, who was indulgent, she had ardent affection, regarding him then and always with excessive fondness and admiration. Her talents were precociously developed, and while yet a child, she would listen with eager and intelligent interest to the conversation of the Parisian *savants* who used to frequent her father's house. In 1786 she was married to the Baron de Staël-Holstein, Swedish minister at Paris, an elderly gentleman, with whom her happiness was probably not great; inasmuch as after a few years an amicable separation took place—two sons and a daughter having been the fruit of their union. In 1788 she issued her first work, *Lettres sur les Écrits et le Caractère de J. J. Rousseau*, which are rather a girl's passionate eulogy of an idol than a just and discriminating criticism.

Her sympathy with the Revolution in its earlier stage of promise was enthusiastic, but gave place, as its later enormities were developed, to a reaction of horror vividly set forth in her subsequent *Considérations sur la Révolution Française*. Her grief was extreme on the failure of the attempt by the royal family to escape; and she engaged in a secret scheme for securing them a flight to England. This came to nothing; and she then, with her father, betook herself to Switzerland, his native country. The news of the king's execution inexpressibly shocked her; and she sought to save the life of the queen by publishing *Réflexions sur le Procès de la Reine, par Une Femme*, which, however, was too late to be effective. In 1795 she published at Lausanne, under the title *Recueil de Morceaux Détachés*, a collection of her juvenile writings; and the next year a treatise *De l'Influence des Passions sur le Bonheur des Individus et des Nations*, a work unmistakable in its indications of rare talent. In 1797, order having been re-established under the directory, she was again in Paris. From the first, she distrusted Napoleon, and suspected him of evil designs; and her *salon* became the headquarters of the anti-Bonapartist faction. In vain she was offered restitution of two million livres since 1788 due to her father from the royal treasury; she declined the bribe; and as neither fear nor favor could lead her to disguise her hostility to Napoleon, it seemed well for him to rid himself of her. She was forbidden to live in Paris, and subsequently (1802) exiled from France itself. Meanwhile, she had greatly increased her reputation by the publication of her romance of *Delphine*, and a work *Sur la Littérature considerée dans ses Rapports avec l'État Moral et Politique des Nations*. She now, for two years, travelled in Italy and in Germany, making at Weimar the acquaintance of Goethe, Schiller, Herder, Wieland, etc. The death of her father 1804 re-

called her to Coppet, in Switzerland. Subsequently, she was permitted to return to Paris; and there, 1807, she published her famous *Corinne, ou l'Italie*, whose success was instant and immense, and won for her a European reputation. As a bitter in the sweet of fame, however, fresh difficulties with Napoleon occurred; and the unrestrained spitefulness of her antagonism caused her to be banished anew to Coppet. Her son, the Baron Auguste, then 17 years old, sought to intercede for his mother in a personal interview granted him by the emperor, whose inexorable deliverance on the occasion was characteristic and amusing: 'Avec l'exaltation de sa tête, la manie qu'elle a d'écrire *sur tout et à propos de rien*, elle pouvait se faire des prosélytes; j'ai dû y veiller.' And it must be conceded, despite the shrieks about Napoleon's 'ungenerous persecution,' that he acted on a sound prudential policy. A woman who would keep no terms with him, who was uncompromising and fearless, and whose genius and reputation gave her influence, was clearly in Paris, of all places, not to be tolerated by the head of a government such as his, more or less the sport of the hour, and always in its basis precarious. After this, when disgusted with Coppet, where she found herself subjected to a petty *surveillance*, Madame de S. rushed restlessly over Europe to Vienna, Moscow, St. Petersburg, thence through Finland to Stockholm, and afterward to London, where, 1813, she published her great book, *De l'Allemagne*, previously suppressed in Paris. As the first decisive revelation of the genius of Germany to the French people—somewhat as the earlier writings of Thomas Carlyle revealed it to the reading public of Britain—this may perhaps rank as the most important and influential of her works. Of her various experiences of travel, an interesting record is preserved in her *Dix Années d'Exil*. At the restoration, she returned to her beloved Paris; from Louis XVIII. she had a most gracious reception; and restitution was granted her of the two millions on her father's account above mentioned. Soon afterward her health failed; she sought its restoration in a visit to Italy 1816, but without effect; and the next year she died at Paris. She was buried at Coppet; and by her will the fact was revealed that, in 1812, she had privately married M. de Rocca, a French officer of hussars, aged 25—something of an *escapade* for a mature matron of 46. In this wedlock she gave birth to a son. M. de Rocca survived her only a few months. On the whole, she had scarcely been happy, as cursed with the 'desires infinite and hopes impossible' which make life little better than a sad unfulfilled longing to one of her peculiar temperament and genius. Her touching wail of *Jamais, jamais, je ne serai jamais aimé comme j'aime* was a cry out of her inmost heart. In this light, there may seem some element of pathos in this marriage, otherwise not without an element of the ridiculous.

Madame de S. has been ranked in the first class of female genius. During the second quarter of the 19th c. her *Corinne* had immense vogue in Europe and America

among the literary classes. It is now little read except as a curiosity. The type of sentimentalism to which it appealed no longer sways the public mind. Madame de S. was indeed a woman of remarkable intellectual force, but it scarcely seems a creative force: rather its work seems to have been that of receptiveness and interpretation; and this is wrought in the forms of a rich and impassioned rhetoric. She has curtly, and perhaps not with entire aptness, been defined as a sort of Rousseau in petticoats.

Her son published an ed. of her works in 18 vols. 1821, with a biographical notice by Madame Necker de Saussure. —See Norris, *Life and Times of Madame de S.* (1853); and Dr. Stevens, *Madame de S.: a Study of her Life and Times* (2 vols. 1880).

STAFF, n. *stâf*, plu. STAFFS, *stâfs*, or STAVES, *stāvz* [Icel. *stafr;* Dut. *staf;* Dan. *stab, stav;* Ger. *stab,* a staff: Gael. *stob*, a stake: L. *stīpēs*, a stake or stock]: stick or club carried in the hand for support or defense; pole; long handle: badge of authority or office: that which upholds; prop: in *music*, the five parallel lines, and the four spaces between them, on which the notes and other musical characters are indicated—also STAVE (see GAMUT: MUSIC: SOLFEGGIO: ETC.): in *OE.*, a stanza. STAFF, plu. STAFFS, a body of officers attached to an army, or to its commander, whose duty is to assist the commander in carrying his plans into execution, and in maintaining the army in a state of efficiency (see STAFF, MILITARY OR NAVAL): a number of persons engaged to act together in any undertaking or work, as a *staff* of clerks, a *staff* of reporters. STAFF, plu. STAVES, step or round of a ladder. STAFF-ANGLE, in *arch.*, a square rod of wood or other material standing flush with the finished plastering of the wall on each side at the external angles of the plastering. JACOB'S-STAFF, a rod or pointed staff shod with iron for fixing in the ground, having a socket at the top for a compass, used in surveying. CROSS-STAFF, a staff with sights at right angles, used in surveying. FLAG-STAFF, a lofty pole on which a flag can be hoisted.

STAFF, n. *stăf* [prob. a variant of *stuff*]: composition for building purposes, statuary, etc.; composed chiefly of plaster of Paris, mixed with a little cement, glycerin, and dextrin in water. It was largely used at the Columbian Exposition, 1893.

STAFF, MILITARY OR NAVAL: body of skilled officers, whose duty it is to combine and give vitality to the movements and mechanical action of the several regiments and drilled bodies—or of the several ships, squadrons, etc.—composing the force. The distinction between an officer on the S. of an army and a regimental officer is that the latter is concerned with his own regt. alone, while the former deals with his army, or section of an army exceeding a regt., and regulates the combined action of the several arms and bodies of men. A good S. is all-important to the success of a military enterprise.

The General S. of an army is a corps of officers charged with the duty of assisting the commander-in-chief in arranging details of marches, operations, and battles, in issuing commands for the movement of troops, in directing

reconnaissances, in conducting the correspondence of the commander with the national war department and the several corps d'armée in the field. In some govts. the General S. in time of peace is divided into sections for systematically studying problems of offensive and defensive war, collecting information as to the military status of foreign countries, making tours of observation, devising plans for rapid mobilization, transportation, and concentration, noting new inventions in arms and war material. In France, Russia, and England are institutes for training officers for the General S. The General S. of an army in the field consists of a chief of S., adjt.gen., commissary-gen., quartermaster-gen., chief of artillery, chief engineer, and the like.—In the United States the General S. consists of the 'maj.gen. commanding the army' (see GENERAL OFFICER), Adjt.gen. (q.v.), Inspector-gen. (q.v.), Judge-advocate-gen. (q.v.), quartermaster-gen. (see QUARTER: QUARTERMASTER'S DEPARTMENT), commissary-gen. of subsistence, surgeon-gen., Paymaster-gen. (q.v.), chief of engineers (see ENGINEERS, U. S. CORPS OF), chief of ordnance (see ORDNANCE DEPARTMENT).—In the U. S. navy the term S. is used to designate only the non-combatant officers attached to the navy, as the medical corps (see MEDICAL DEPARTMENT), pay corps (see PAYMASTER-GENERAL OF THE NAVY), steam-engineers' corps (see ENGINEERS IN THE U. S. NAVY), professors of mathematics in the naval school, naval constructors, and the like; but the officers of the several bureaus of the navy dept. (e.g., see ORDNANCE, BUREAU OF) in effect constitute a naval S. comparable to the army S.: these bureaus are those of Ordnance (q.v.), equipment and recruiting, navigation, yards and docks, provisions and clothing, steam-engineering, medicine and surgery (see MEDICAL DEPARTMENT), construction and repair, judge-advocate-gen., inspection and survey, naval intelligence.—The 'Personal S.' consists of the aides-de-camp and military secretaries of general officers in army or navy.—See in general, titles of various milit. and naval officers: also GENERAL OFFICER: EQUIPMENT: MANNING THE NAVY: REGIMENT: UNITED STATES ARMY: UNITED STATES NAVY.

STAFFA, *stăffa:* celebrated island, w. of Scotland, about 7 m. off the w. coast of Mull. It forms an uneven table-land, rising at its highest 144 ft. above sea-level; 1½ m. in circumference, oval in shape. In the n.e., in the lee of the prevailing winds, is a tract of low shore stretching out in beaches and forming a landing-place. The other parts of the coast are girt with cliffs 84 to 112 ft. high. Regarded in section, the rocks show themselves of three kinds—conglomerated tufa, forming the basement; columnar basalt, arranged in colonnades which form the façades and the walls of the chief caves; and amorphous basalt, overlying the columnar basalt, but pierced here and there by ends of columns and by angular blocks. The most remarkable feature of the island is Fingal's Cave, or the Great Cave, whose entrance is formed by columnar ranges on each side, supporting a lofty arch. The en

trance is 33 feet wide, 60 feet high; length of the cave 212 feet. The floor of this marvelous chamber is the sea, which throws up flashing and many-colored lights against the pendent columns whitened with calcareous stalagmite, which forms the roof, and against the pillared walls of the cave.

STAFF COLLEGE, in the British Army: government institution founded 1858, about 2 m. from Sandhurst, for higher instruction of 40 officers aspiring to appointments on the staff; thus taking the place, though more effectively, of the old senior class at the Royal Military College.

STAFF CORPS, *kōrz,* in the British Army: bodies of intelligent officers and men who aid the general and staff officers by performing camp duties, reconnaissances, and other necessary labors unsuitable for regimental officers or soldiers. Such a corps served during Wellington's campaigns, and then was disbanded. Similar corps have since been occasionally organized for various departments; but all except the Army Hospital Corps were merged 1870 into the Army Service Corps.—Staff corps is also the name given to the English officers serving on the permanent Indian establishment.

STAFFORD, *stăf'fėrd:* inland county of England, between the counties of Cheshire and Warwick; 748,433 acres, or about 1,170 sq.m. The most elevated portion is the north, where wild moorlands in long ridges, separated by deep valleys, extend n.w. to s.e., subsiding as they near the valley of the Trent. The surface is low or undulating in the midland regions, hilly in the south. New red sandstone occupies the whole central part; the Pottery coal-field occupies the north, and the Dudley coal-field, remarkable also for its abundant and rich iron ores, occupies the south. The Trent, flowing first s.w. through the county, then n.e. along its e. border, is the chief river. The climate is cold and humid; and though three-fourths of the area is arable, much of the soil is cold and clayey, and agriculture is in a backward condition. At the Potteries around Stoke, Burslem, and Hanley there is extensive manufacture of china and earthenware (see POTTERY; WEDGEWOOD). In the south there is extensive iron manufacture in all branches, from mining to production of articles in iron and steel. Numerous canals (including the Grand Trunk canal) and railways traverse the county. Pop. (1901) 879,625.

STAFFORD, England, capital of Stafford, on the River Sow, 25 m. s.e. of Crewe. The principal buildings include the Church of Saint Mary's, which has fine stained glass and many interesting monuments; Saint Chads, a fine old Norman church; a stately county hall; a borough hall, containing a museum, and the market hall; hospital, asylum, a Latin school (1550), technical schools, and a theatre. The town has extensive tanneries and manufac-

tures leather goods, engineering and electrical works. Pop. (1901) 20,894.

STAF'FORD, HENRY, Duke of Buckingham: 1440-1483, Nov. 1; b. England. When 20 years of age he received his title, but for some time did not become prominent. He was one of the leaders in the plot of the Duke of Gloucester, then Protector, and afterward Richard III., to seize the throne 1483; assisted in the overthrow of Earl Rivers and Lord Gray, and was rewarded by appointment as chief-justice and constable of the royal castles in Wales. In June of the same year he made an address at Guildhall in which he forcibly presented the claims of Richard as sovereign. In less than a month from that time he was appointed constable of England, but soon deserted the king, joined the Lancastrians in their conspiracy, was promptly betrayed by supposed friends, was tried and condemned, and was beheaded at Salisbury. He is one of the characters in Shakespeare's tragedy *King Richard III.*, in the acting version of which (greatly changed from the original) is the line (taking the place of 7 lines) from the king:

'Off with his head! so much for Buckingham.'

STAFFORD, WILLIAM HOWARD, Viscount: an English statesman: b. 1614, Nov. 30; executed on Tower Hill 1680, Dec. 29. He was the son of the 20th earl of Arundel, the well-known collector of the Arundelian marbles. In 1640, Nov., he was created Viscount Stafford. He was brought up in the Roman Catholic faith, and adhered during the civil wars to the royal cause; but after the Restoration he was frequently found in opposition to the court, although he appears never to have played an important part as a legislator. He was singled out by Titus Oates, the contriver of the 'popish plot,' as one of his chief victims. On Oct. 23, 1678, Oates deposed before the House of Commons that upon the subversion of the kingdom by the Jesuits, Lord Stafford was to have the appointment of paymaster of the army; and on the 30th the accused nobleman was committed to the Tower, with other Catholic peers against whom similar charges had been preferred. After lying two years in prison, he was brought to trial on a charge of high treason, 1680, Nov. 30. During a trial of seven days he defended himself by pointing out the weakness of Oates' evidence, so that Evelyn, who was present, thought 'such a man's testimony should not be taken against the life of a dog.' Nevertheless a verdict of guilty was pronounced by a vote of 55 to 31. He was executed three weeks afterward.

STAFFORD SPRINGS: Conn.; borough in Tolland co.; on the Willimantic river, and on the Central Vermont railroad; about 48 m. n. of New London and 18 m. n.w. of Willimantic. It is in an agricultural and a manufacturing section of the state. The chief manufacturing establishments are woolen mills, iron works, ma-

chine shops, flour mill, creameries, and tobacco works. There are Protestant Episcopal, Roman Catholic, Congregational, and Methodist Episcopal churches. The educational institutions are a public library, founded in 1874, a high school, and public and parish schools. The national bank has a capital of $50,000; there is one savings bank. Stafford Springs is a favorite resort for health seekers on account of the mineral springs. Pop. (1900) 2,460; (1910) 3,059.

STAG, n. *stăg* [a name applied to the male of various animals: Icel. *steggr*, a he-bird, drake, tom-cat: Scot. *staig*, a stallion or young horse]: the male deer; fem. *hind* (see below): a reindeer in his fifth year: in *stock exchange slang*, an unlicensed or unrecognized dealer in shares; one without means who applies for an allocation of shares in a joint-stock concern with a view to selling them at a profit. STAG'GARD, n. *-gĕrd*, a stag four years old. STAG-BEETLE. STAG-EVIL, kind of palsy in the jaws of horses. STAG-WORM, a worm troublesome to deer.

STAG, or RED DEER (*Cervus elaphus*): species of deer with round antlers, which have a snag at the base in front. The female (*Hind*) has no horns. The young male, during the first year, acquires mere knobs in place of horns. In the second year, the knobs are longer and pointed, and the animal is called a *Brocket*. The branching of the horns increases every year till the sixth, when the name Hart begins to be applied. After this the age is no longer indicated by an increased number of branches, but the antlers become larger and thicker, their furrows deeper, and the *burr* at the base more projecting. The oldest stags have seldom more than 10 or 12 branches, though an instance has occurred of 33 on each antler. A fine stag is four feet or more in height at the shoulder. The color is reddish brown in summer, the rump pale; in winter it is brownish gray. The female is smaller than the male. The young is at first spotted with white. The stag is a native of Europe and n. Asia. It was anciently common in all parts of Britain, but is now almost extinct, except in the Highlands of Scotland, where large herds still exist, particularly on the Grampians, and the sport of deer-stalking is pursued, in which the rifle is now generally used; though formerly the stag was hunted with hounds of peculiar breed, called staghounds. The forest laws of England were extremely strict for preservation of this noble game—the unauthorized killing of a stag being even a more unpardonable offense than the killing of a man. The stag feeds on the buds and young shoots of trees, and on grass; or, in severe winter weather, on bark and mosses. Its speed is very great: it has also great powers of swimming, and has been known to swim 10 miles. When hard pressed by hunters, it turns to bay, and is not approached without danger. At the pairing season, in Aug., even the tame stags become so excited that it is not safe to approach

them. The domestication of the stag is never quite complete. In fighting, the stag uses not only its horns, but its fore-feet, with which it gives severe blows to an adversary. The flesh is not so good as that of the Fallow Deer.—Among the species of deer most nearly allied to the stag are the Wapiti, an American species, and several species belonging to the warmer parts of Asia and n. Africa. They all have round branched antlers, with a basal snag in front, and a tuft of hair on the hind legs.

STAG BEETLE (*Lucanus*): genus of coleopterous insects, of family *Lamellicornes*, remarkable for the large projecting mandibles of the males, which have large denticulations, and somewhat resemble stag's horns. The antennæ terminate in a club of many leaflets disposed on an axis like the teeth of a comb. The COMMON STAG BEETLE (*L. cervus*) is one of the largest of British insects, the males being fully two inches long. It flies about in the evening in the middle of summer, chiefly frequenting oak-woods. The larva feeds on the wood of the oak and the willow, and is injurious to the trunks of trees, into which it eats its way very rapidly. It is supposed to be the *Cossus* of the ancient Romans, esteemed by them as a delicacy of food. It lives several years before undergoing its transformations. In its perfect state, the stag beetle is a formidable-looking insect, and its powerful mandibles are capable of inflicting a severe bite, if it is incautiously seized; but it is not venomous. Some of the tropical stag beetles are remarkable for brilliancy of color.—A species of stag beetle found in the United States is *Lucanus elaphus*.

STAGE, n. *stāj* [OF. *estage*, a story, height of a house —from L. *sto*, I stand: It. *staggio*, a prop]: elevated platform for an exhibition, etc.; a floor; a story; a landing-quay or pier; the theatre or theatrical representations—also, the actual part where the performance takes place (see THEATRE): any place where a thing is publicly done or transacted; place of time or action, as the *stage* of life; a resting-place on a journey; a stage-coach; the distance traveled over without resting; degree of progress or advance, as the *stages* of a disease: V. in *OE.*, to exhibit publicly. STAGER, n. *stā'jĕr*, a person practiced in cunning; a horse that runs in a stage-coach. STA'GING, n. *-jĭng*, a temporary structure of boards and posts for support. STAGEY, a. *stā'jĭ*, *familiarly*, characterized by a theatrical and bombastic style or manner, as a *stagey* manner. STAGE-BOX, a box close to the stage in a theatre. STAGE-COACH, a coach running between two places with certain points of rest. STAGE-PLAY, a theatrical entertainment. STAGE-PLAYER, an actor on the stage. AN OLD STAGER, an old practitioner; one who has long lived in the same place or belonged to the same society.

STAGER, *stā'jĕr*, ANSON: 1825, Apr. 20—1885, Mar. 26; b. Ontario, N. Y.: telegrapher. In 1841 he entered the printing establishment of Henry O'Reilly; and when, soon afterward, his employer engaged in building and operating telegraph lines, S. went with him, and 1846 was placed in charge of the first office (at Lancaster) on the line between Philadelphia and Harrisburg. In 1852 he was made gen. supt. of the lines centring in Cincinnati, and retained the office after the Western Union Co. acquired the lines. At the beginning of the civil war he was placed in charge of the lines in O. and along the Va. border; and soon afterward was appointed gen. supt. of all the govt. telegraph lines. He resigned from the service 1868, Sep., with the rank of brev. brig.gen. In 1869 he settled in Chicago; again became gen. supt., and was connected with many electrical and manufacturing concerns till his death.

STAGGER, v. *stăg'gĕr* [prov. Dan. *staggre*, to stagger: Icel. *stakra*, to totter; *staka*, to push: O.Dut. *staggeren*, to stagger as a drunken man]: to totter; to reel; to walk with a series of abrupt movements while swaying from side to side; to cause to totter; to begin to give way; to cause to hesitate; to shock; to alarm: N. a sudden swing of the body as if the person were about to fall. STAG'GERING, imp.: ADJ. reeling; unsteady: N. the swinging unsteady motion of the body as if about to fall. STAG'GERED, pp. *-gĕrd*. STAG'GERINGLY, ad. *-gĕr-ĭng-lĭ*. STAG'GERS, n. *-gĕrz*, disease in horses and cattle, attended with reeling or giddiness (see below): in *OE.*, wild conduct; irregular behavior.—SYN. of 'stagger, v.': to reel; totter; faint; hesitate; shock; alarm.

STAGGERS, *stăg'gĕrz*: popular term applied to several diseases of horses. Mad or Sleepy S. is inflammation of the brain, a rare but usually fatal complaint, marked by high fever, staggering gait, violent convulsive struggling usually terminating in stupor: it is treated by bleeding, full doses of physic, and cold applied to the head. Grass or Stomach S. is acute indigestion, usually from overloading the stomach and bowels with tough hard grass, vetches, or clover, a full meal of wheat, or other indigestible food. It is most frequent in summer and autumn, is indicated by impaired appetite, distended abdomen, dull aspect, unsteady gait; and is remedied by full doses of purgative medicine, such as six drachms of aloes and a drachm of calomel rubbed down together, and given in a quart of thin well-boiled gruel. Frequent clysters, with hand-rubing and hot water to the belly, likewise are useful. Where the dulness increases, stimulants should be freely given: see HYDATIDS. For the S. in sheep, see STURDY.

STAG'HOUND: large and powerful kind of Hound (q.v.), formerly much used in England for hunting the stag; now almost extinct. It is supposed to be a breed of the old English Southern Hound. In scent, it is almost equal to the bloodhound; in fleetness, it is inferior to the foxhound. It has great endurance, and has been known to run 50 m. after the stag. It is also courageous, and does not hesitate to attack the stag at bay.

STAGING: see under STAGE.

STAGIRA, *stā-jī'râ*, or STAGI'ROS, *-rŏs:* ancient town of Thrace, noted as the birthplace of Aristotle, who is hence called 'The Stagirite.' Its modern name is Stavros. S. was founded B.C. 656 by a colony from the island of Andros. It stood on the peninsula of Chalcidice in the Strimonian Gulf (Gulf of Orfano). When Thrace was conquered by the Macedonians, S. was destroyed, but it was restored by Philip II. at Aristotle's request.

STAGIRITE, n., improperly STAGYRITE, n. *stăj'ĭ-rīt:* name often applied to Aristotle, the great philosopher, from the place of his birth, Stagira (q.v.).

STAGNATE, v. *stăg'nāt* [L. *stagnātus*, pp. of *stagnārĕ*, to be still—from *stagnum*, a piece of standing water—from *sto*, I stand: It. *stagno*, standing water: comp. Gael. *stang*, a pond]: to be or become motionless; to stand still; to cease to flow; to grow or be dull, as business. STAG'NATING, imp. STAG'NATED, pp. STAG'NANT, a. *-năn't* [F.—L.]: not flowing; motionless; still; inactive; dull. STAG'NANTLY, ad. *-lĭ*. STAG'NANCY, n. *-năn-sĭ*, or STAGNATION, n. *stăg-nā'shŭn* [F.—L.]: the state of being without motion; the cessation of action; state of being dull.

STAHEL, *stâ'ĕl*, JULIUS: milit. officer: b. Csongrad, Hungary, 1825, Nov. 4. At the outbreak of the Hungarian revolution he had become a 1st lieut. in the Austrian army; but he joined the revolutionists and served till their defeat, when he went to Germany, then to England, and finally settled in New York, and engaged in journalism. In 1861, May, he was appointed lieut.col. 8th N. Y. vols.; was promoted col. for bravery at the first battle of Bull Run, brig.gen. 1861, Nov. 12, and maj.gen. 1863, Mar. 14; and resigned 1865, Feb. 8. He was U. S. consul at Yokohama 1866–69, engaged in mining 1870–77, again consul at Yokohama 1877–84, and consul-gen. at Shanghai from 1884, Mar., till his resignation the following year.

STAHL, *stâl*, GEORG ERNST: German chemist and physician: 1660, Oct. 21—1734, May 14; b. Anspach. He studied medicine at Jena, and after practicing successfully was called 1694 to the chair of medicine, anatomy, and chemistry, in the newly founded Univ. of Halle; whence he removed to Berlin 1716, where he was appointed physician to the king of Prussia. He was a member of the Berlin Acad.; and in that city he died —According to Blumenbach, S. was one of the greatest and most profound physicians that the world has ever seen; but the mysticism with which his works are imbued is to be reprehended. S.'s system of medicine, a combination of the physiology of Van Helmont (q.v.) with the psychology of Descartes (q.v.), is founded on the theory of the existence of a mysterious force residing in, but independent of and superior to, matter; this force, the *anima* (or 'soul'), not only forms the body, but directs it in the exercise of all its functions, and this, too, sometimes unconsciously; though the way in which this influence is exercised S. does not explain. Being by nature subject to error, the 'anima,' by negli

gence or maladroit action, originates diseases in the body, which it then attempts to cure, through the functional action of the various parts. S. held that art ought to begin only where nature had ended, and, to be useful, should follow a similar course of action: he was of opinion also that plethora, local or general, was a chief cause of disease. His system of therapeutics corresponded with his pathological principles, and was confined mostly to bleeding and use of mild laxatives. His psychological theory of the connection between the soul and body (known as Stahlism or Stahlianism, one of the forms of Animism —q.v.) led him into a discussion with Leibnitz (who had falsely charged him with propounding materialism), from which he emerged victorious on the essential points of their respective theories; though Leibnitz (q.v.) had the advantage in matters of detail. (See SOUL: SPIRIT: ETC.) Subsequent physiologists ridiculed S.'s opinions; yet his doctrine of the 'anima' is, under the name of 'vital principle' and 'nature,' now generally adopted—though usually conceded to be a somewhat vague hypothesis; but his supercilious contempt for chemistry as a medical agent was discreditable, and has long ceased to find scientific advocacy. Nevertheless, S. was one of the ablest chemists of his time: he destroyed, in his usual trenchant style, numberless absurd opinions which had found their way into the science, and propounded the first theory of combustion (see PHLOGISTON), which was universally accepted till the time of Lavoisier (q.v.). His works, according to Haller, number 250; but the chief are: *Theoria Medica Vera* (Halle 1707,08,37), containing his medical theory; and *Zymotechnia Fundamentalis, seu Fermentationis Theoria Generalis* (Halle 1697), presenting his chemical opinions. For his opinions, see Haller's *Bibliotheca Medicinæ Practicæ*, III.; Sprengel's *Histoire de la Médecine;* A. Lemoine's *Le Vitalisme et l'Animisme de Stahl* (Paris 1864).

STAID, a. *stād* [a corruption of *stayed*, the pp. of *stay* (see STAY 2)]: not vacillating; grave; sober; not wild or flighty. STAID'LY, ad. *-lĭ*. STAID'NESS, n. *-nĕs*, steadiness; regularity; gravity.—SYN. of 'staid': sober; steady; grave; regular; composed; sedate; constant; firm; stable.

STAIGG, *stāg*, RICHARD MORRELL: 1817, Sep. 7—1881, Oct. 11; b. Leeds, Eng.: artist. He began studying architecture and portrait-painting in Leeds; came to the United States 1831; and, settling in Newport, R. I., 1835, resumed the study of portrait-painting under the encouragement of Washington Allston and Jane Stuart. For many years he made a specialty of miniature-painting, subsequently painted life-size in oil, and in the latter part of his life applied himself to landscapes and genre studies. He was elected an associate of the National Acad. of Design 1856, and an academician 1861; and visited Europe 1867–69 and 1872–74.

STAIN, v. *stān* [OF. *desteindre,* to deaden or take away the color of—from L. *dis,* away; *tingĕrĕ,* to dye]: to discolor; to tinge of a different color; to blot; to render foul; to tarnish; to bring reproach; to mark with guilt or infamy; to impress or mark with a variety of colors: N. a blot; a foul spot; a spot of different color from the ground on which it is: liquid coloring-matter designed to be absorbed by wood, ivory, or other material; often used to give cheaper wood the appearance of more costly kinds—these stains are chiefly metallic salts combined with vegetable infusions; often used also to give new work an appearance of age; taint of guilt; infamy; disgrace. STAIN'ING, imp.: N. the process of making stains or tints, as on glass or paper. STAINED, pp. *stānd.* STAIN'ER, n. *-ėr,* one who stains. STAIN'LESS, a. *-lĕs,* free from imperfections or blots; pure; faultless; free from guilt or sin. STAINED GLASS, glass variously colored, the colors being fused into it (see GLASS). PAPER-STAINER: see under PAPER.—SYN. of 'stain, v.': to color; paint; blot; dye; discolor; taint; disgrace; soil; sully; spot; pollute; blemish; tarnish; shame.

STAINER, *stīn'ėr,* Sir JOHN, MUS.DOC.: born England, 1840; d. 1901. He graduated at Oxford, in both arts and music; became organist at Magdalen College when only 19 years of age, and was organist at St. Paul's Cathedral, London, 1872-88. He was knighted 1888, and the following year became professor of music in Oxford University. Dr. Stainer was a brilliant instrumentalist, and a thoroughly scientific musician. He composed numerous songs, anthems, and cantatas, and published various elementary works on music, a *Treatise on Harmony,* which passed through several editions, and *The Music of the Bible.*

STAIR, n. *stär* [AS. *stager,* a ladder, steps—from *stigan,* to step up: Dut. *steiger,* a mason's scaffold: Icel. *stigr,* a footway: Ger. *steg,* a path: Sw. *steg,* a step: Gael. *stair,* stepping-stones over a river]: a step. STAIRS, plu. *stärz,* series of steps upward or downward. STAIRCASE, inclosed series of steps from one level in a building to another. This feature, now so important in houses, was of small note till about the middle of the 16th c. Previously, all stairs were constructed on a circular plan, winding round a central axis or newel, and were called turret or cork-screw stairs. During the 16th and 17th centuries, staircases with wide, straight flights were introduced, and were made leading features in mansions of the Elizabethan style: they had usually massive oak balusters with carved pedestals, and were ornamented with carved panels, pendants, etc. Staircases of this kind are still in common use, but mostly have been lighter in style, light cast-iron railings being sometimes substituted for the heavy oak balustrades. In recent years there is a return toward the massive and elaborate wooden construction. BELOW-STAIRS in the basement or

lower part of a house. UP-STAIRS, in the higher rooms: the bedrooms. FLIGHT OF STAIRS, series of steps to the top of a tenement, or from one story to another; a staircase. ONE PAIR, TWO PAIR OF STAIRS, the first and second floors.

STAIR, EARLS OF. See DALRYMPLE.

STAITH, n. *stāth* [Icel. *stöd;* Dan. *stade,* a landing-place, a station: Ger. *gestade,* a shore: Norw. *stöd,* a quay]: a landing-place for merchandise; a place where coals are shipped; a line of rails forming the extremity of a railway, laid on a stage or platform.

STAKE, n. *stāk* [allied to STACK and STICK: Dan. *stage;* Sw. *stake;* OF. *estac,* a stake, a tie: Ger. *stake;* O.Dut. *staeck,* a stake; a stake for which one plays]: post or slab of wood sharpened at one end and firmly set in the ground, to which anything may be fastened; a piece of rough wood forming one of the uprights of a fence: martyrdom, because martyrs were bound to stakes when burned: anything placed in the hands of another, particularly money, to wait the result of a wager; state of being hazarded or pledged: small anvil: V. to support with stakes; to mark the limits off by stakes; to wager; to pledge; to hazard. STA'KING, imp. supporting or marking out with stakes; putting to hazard upon a contingency. STAKED, pp. *stākt.* STAKE-HEAD, in *rope-making,* slab or post with wooden pins to keep the strands apart. STAKE-HOLDER, one who holds the stakes or money intrusted to him by parties to a wager till the result be determined. STAKE-NET, net secured and outstretched by means of stakes (see SALMON). AT STAKE, in danger; hazarded; pledged. AT THE STAKE, at the post and fagots to suffer martyrdom by burning.

STAKED PLAIN, *stākd plān* (Sp. LLANO ESTACADO): a name once applied to the rainless region of the south-western United States.

STALACTITES, n. plu. *stă-lăk'tīts* [Gr. *stalak'tos,* trickling or dropping—from *stalas'sō,* I fall or distil in drops]: icicle like incrustations of carbonate of lime, chalcedony, etc., which often cover the roofs of caverns and fissures, formed from the dropping water holding these substances in solution (see STALACTITES AND STALAGMITES). STALAC'TIC, a. *-tĭk,* or STALAC'TICAL, a. *-tĭ-kăl,* or STALACTITIC, a. *stăl'ăk-tĭt'ĭk,* pertaining to or resembling a stalactite. STALAC'TIFORM, a. *-tĭ-fawrm* [L. *forma,* a shape]: resembling or shaped like a stalactite.

STALAC'TITES AND STALAG'MITES: mineral formations in caves and other places where water charged with carbonate of lime is subject to evaporation. Water impregnated with carbonic acid is able to dissolve lime; and as all rain and surface water contains more or less carbonic acid, it takes up in its passage through the earth to the roofs of caves a certain amount of lime. When this water is exposed on the roof or floor of the

cave, evaporation takes place: thus both the bulk of the water and its solvent power (depending on the free carbonic acid, which escapes) are reduced, and a thin pellicle of solid carbonate of lime is deposited. When this takes place on the roof of the cave, long icicle-like pendants are formed, called stalactites; and when the water drops upon the floor, a stalagmitic layer is formed, which rises at the points where the largest supply of material exists, in the form of pillars (stalagmites), to meet the overhanging stalactites. In some caves, the descending and ascending points have met, and formed a series of natural columns as if supporting the roof. The color of the limestone thus formed is affected by the superincumbent strata, but is generally white or yellowish. The stalactites have a rich subcrystalline structure, being composed of acicular radiating crystals, arranged in concentric layers from their exogenous growth: sometimes, from metamorphic changes subsequent to their formation, they become more truly crystalline. The amount of deposition is very great in some caves, and the wonderful variety and singular groupings of the stalactites give them a peculiar beauty. The caves most remarkable in this way are the Mammoth Cave, Ky.; Wyandotte Cave, Ind.; Luray Cave, Va.; the Cave of Adelsberg in Styria; the Grotto of Antiparos in the Grecian Archipelago; and the caves of the Peak in Derbyshire, England.—The remains of primeval man found in the caves in France, and the fossils from the bone caves in Britain and elsewhere, are generally cemented together into a stalagmitic deposit on the floor of the cave. See CAVES.

STALAGMITE, n. *stăl-ăg'mīt* [Gr. *stalag'ma*, a drop —from *stalas'sō*, I fall or distil in drops]: the same mineral matter as *stalactites*, but applied to the incrustations that cover the floor of the cavern; the stalactites and stalagmites frequently meet together, and form pillar-like masses. STALAGMITIC, a. *stăl'ăg-mĭt'ĭk*, or STAL'AGMIT'ICAL, a. *-ĭ-kăl*, having the texture or structure of stalagmite—applied to limestones which have an open, porous, and somewhat concretionary structure. See STALACTITES AND STALAGMITES.

STALE, a. *stāl* [O.Dut. *stel*, old]: having lost its freshness; old; long kept; vapid or tasteless from age; worn out by age or use; common; trite; no longer pleasing, as a story: V. in *OE.*, to wear out; to make old: N. in *OE.*, that which is stale; a prostitute. STALE'LY, ad. *-lĭ*. STALE'NESS, n. *-nĕs*, the state of being stale; vapidness. STALE DEMAND, a claim which has not been pressed or claimed for a very long time.

STALE, v. *stāl* [Dut. *stallen*; OF. *estaler*; It. *stallare*, to pass urine when stopping on the road for that purpose —*lit.*, to come to a stand, from the root of *stall*: comp. Gael. *steall*, a gush, an outpour]: to urinate or pass water, as horses or cattle: N. in *OE.*, urine. STAL'ING, imp. STALED, pp. *stāld*.

STALE, n. *stāl* [Dut. *stelle*, position, place: Ger. *stellen*, to place, to post]: in *OE.*, a bait laid to entrap; a decoy; a snare. STALEMATE, or STALE, a fixed state; a term in chess indicating a condition in which the game cannot proceed, the king having no move but into check.

STALE, n. *stāl* [Dut. *steel;* Ger. *stiel*, a stalk, a pillar]: in *OE.*, a stalk; a handle; a prop; a pillar.

STALIM'NE: see LEMNOS.

STALK, v. *stawk* [imitative of the sound of setting down the foot: AS. *stælcan*, to step: Dan. *stalke*, to go with high and long steps: Norw. *stauka*, to stump along like an old man with a stick: Gael. *stalc*, to dash the foot against, to stiffen]: to stride; to walk with high and affected steps; to creep along softly and warily; to walk behind something that covers. N. a proud stately step or walk. STALK'ING, imp.: ADJ. walking with stately steps. STALKED, pp. *stawkt.* STALK'ER, n. *-ĕr*, one who stalks. STALKING-HORSE, a real or sham horse behind which the fowler or hunter warily approaches his game to snare or shoot it; any mask or pretense. DEER-STALKING, the act of approaching deer warily and stealthily.

STALK, n. *stawk* [Icel. *stilkr*, a stalk: Dan. *stilk*, a stem, a handle: comp. Gr. *stĕl'ĕchos*, a stem, a stump]: the stem or main prop of a plant; the stem or support which attaches a flower or fruit to a plant or tree; the stem or body of a quill; anything resembling a stalk, a very long chimney attached to a public work. STALK'Y, a. *-ĭ*, resembling a stalk; full of stalks. STALK'LESS, a. *-lĕs*, destitute of a stalk.

STALL, n. *stawl* [Icel. *stallr*, that on which anything stands or is placed: AS. *steal*, a place, a stall: Ger. *stall;* It. *stallo;* OF. *estal*, a place, a seat]: place where a horse or an ox is kept and fed; division of a stable allotted to a single horse; small area partially inclosed, either in the open air or within a large building, where articles are exposed for sale; small workshop; reserved seat in a theatre: the raised seat of a dignitary of a cathedral or church, or a fixed seat for one of the official singers, situated in the choir or chancel. A stall is inclosed at the back, and with side-arms, and usually forms one in a row of such seats. One or more rows of these extended along each side of the choir of most churches before the Reformation; and fine examples remain in nearly all the cathedrals—generally inclosed at back with a high screen, and covered with canopies ornamented with pinnacles, etc. Stalls, now common for the singers in Episc. churches, are of less elaborate style. STALL, v. to place or keep in a stall; in *OE.*, to invest; to dwell. STALL'ING, imp.: N. in *OE.*, state of keeping in a stall. STALLED, pp. *stawld.* STALLAGE, n. *stawl'-āj*, right of erecting stalls at fairs: dung from a horse's stall. STALL-FEEDING, practice of keeping and feeding cattle in separate stalls in stables, or small inclosed and covered courts, where they are supplied with food. STALL-FED, a. fed in a stall, as an ox. STALLED OX, a fat ox.

STALLION, n. *stăl'yŭn* [OF. *estalon;* F. . .*alon*, a stallion—from It. *stallone,* a horse long kept in a stable, a stallion—from OHG. *stal,* a stall (see STALL)]: horse kept for breeding; a stock-horse.

STALWART, a. *stawl'wĕrt,* formerly also STAL'WORTH, a. *-wĕrth* [AS. *stælwyrth,* worth taking—probably from *steal* and *worthy,* which see]: large and strong in frame; tall and strong; sturdy; stout; brave; unyielding.

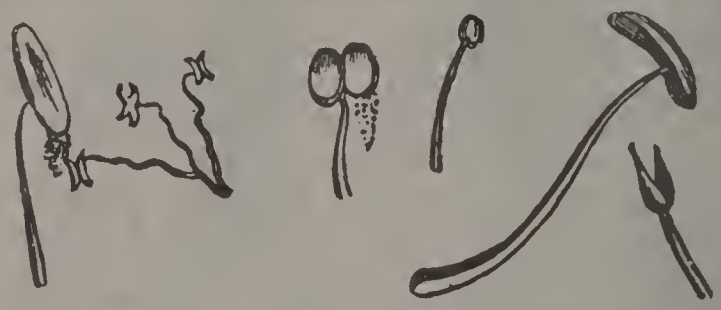
STALYBRIDGE, *stā'lĭ-brĭj:* market-town and parliamentary and municipal borough, partly in Lancashire and partly in Cheshire, England; on the Tame, eight m. e. of Manchester. It is remarkable chiefly for cotton manufactures; but the print-works, iron-foundries, and machine-shops also are numerous and important. Free communication by railway is afforded in every direction. There are in S. 39 mills employing 10,000 hands, and 28 foundries and machine-shops, employing 1,100 hands. Pop. (1871) municipal borough, 21,092; (1881) 22,785; in 1881 its limits were extended from 806 acres to 3,120 acres, with total pop. 25,977; (1901) 46,558.

STAMBOUL': see CONSTANTINOPLE.

STAMEN, n. *stā'mĕn,* plu. STAMENS, *stā'mĕnz,* or STAMINA, *stăm'ĭ-nă* [L. *stamen,* the standing thing, a thread as hanging from the distaff, the warp in the upright loom of the ancients; *stamĭna,* threads—from *sto,* I stand]: solid or firm part of a body: male organs of flowers, situated within the petals, and consisting of stalks or filaments, and anthers containing pollen (see below): basis; foundation. STAMENED, a. *stā'mĕnd,* furnished with stamens. STAM'INA, n. plu. that which constitutes the principal strength and support of a thing; tone or vigor of the animal system. STAM'INAL, a. *-năl,* pertaining to stamens or stamina. STAMINEOUS, a. *stă-mĭn'ē-ŭs* [L. *stamin'ĕus,* thready]: consisting of or having stamens. STAMINATE, a. *stăm'ĭ nāt,* or STAM'INIF'EROUS, a. *-nĭf'ĕr-ŭs* [L. *fero,* I bear]: bearing stamens—applied to a male flower, or to plants bearing male flowers. STAM'INODE, n. *-ĭ-nōd,* or STAM'INO'DIUM, n. *-nō'dĭ-ŭm* [Gr. *eidos,* resemblance]: in *bot.*, an abortive or imperfect stamen. STAMINODY, n. *stăm'ĭn-ŏ-dĭ,* conversion of other parts of the flower into stamens, perfect or imperfect.

STA'MENS: those parts in the flowers of phanerogamous plants which excite the pistil to the formation of the fruit, and thus effect fertilization or Fecundation (q.v.). A stamen consists of a receptacle—*anther;* which contains a dust—*pollen*—various in color, but generally yellow, and usually supported on a stalk—*filament;* the anther being the blade of a metamorphosed leaf, and the filament the leaf-stalk. The filament is, however, sometimes lacking, when the anther is said to be *sessile.* Each anther usually consists of two cells, forming two lobes, which, before they open to give forth the pollen, are again divided into two cell-like parts, and at the time of their maturity open by longitudinal clefts, by pores, or by valves, to scatter the pollen, which is conveyed to the stigma either by its own falling, by the wind, or by the insects which seek

honey in flowers. See PISTIL. The pollen consists of single cells, which are usually free; more rarely, the



Stamens.

pollen of each cell is united into a mass—*pollen-mass* or *pollinium*, as in the *Orchideæ* and *Asclepiadaceæ*. The stamens are found either with the pistil in the same flower, and are then arranged around it, in which case the flower is *hermaphrodite;* or by themselves in separate flowers, therefore called *male* flowers. The stamens are sometimes united together, generally by the filaments which form a tube, when the flower is *monadelphous,* sometimes, by their union, they form two sets, when the flower is *diadelphous;* sometimes three or more, when it is *polyadelphous;* and the filaments are sometimes united with the pistil into a column, from which the anthers spring, as if growing from the pistil, when the flower is *gynandrous.* See BOTANY. The stamens form either one or more whorls, and when in one whorl are either opposite to the petals or alternate with them: the latter is regarded as their normal position. Sometimes, by abortion, there is only one stamen. Being leaf-organs, stamens arise from the axis; but they very frequently grow upon the corolla, so that they seem to have their origin from it. When the stamens seem to arise from the corolla or from the calyx, they, also the flower, are said to be *perigynous* [Gr. *peri,* around, and *gyne,* a wife]; when they grow from the pistil, they are *epigynous* [Gr. *epi,* upon]; and when from beneath it, *hypogynous* [Gr. *hypo,* under]. These distinctions have been much used in classification by Jussieu and others. The transition of petals into stamens can be easily traced in some flowers, e.g., the Water Lily. In double flowers, the stamens have been changed into petals. Linnæus adopted the stamens as the means of his division of plants into classes (see BOTANY); but so far as the classification was founded on their mere number, it was artificial, the number of stamens being various in plants very closely allied. Stamens are among the organs of plants which most frequently display Irritability (q.v.).

The filament assumes great variety of forms. Sometimes it is short and thick, sometimes long and slender; sometimes dilated at the base; sometimes petal-like, with the stamen at its tip; sometimes forked, or divided into three teeth, of which the central one bears the anther; sometimes bent or jointed, sometimes spiral. The form of the anther varies still more than that of the filament; indeed, the variety of forms is endless. The *connective* is a body which

unites the lobes of the anther. When the filament is continuous with the connective, the anther-lobes seeming to be united to it through their whole length, the anther is said to be *adnate* or *adherent;* when the filament ends at the base of the anther, the anther is *innate* or *erect.*

STAMFORD, *stăm'fèrd:* town, in Fairfield co., Conn.; on Long Island Sound, and on the New York New Haven and Hartford railroad; 22 m. w.s w. of Bridgeport, 32 m. n.e. of New York. It was settled by a colony from Wethersfield 1640; was known first as Rippiwam; subsequently included the town of Darien, part of New Canaan, North Castle, Pound Ridge, and Bedford; was incorporated as a borough 1830, and in 1894 was chartered as a city. The surrounding country is devoted mainly to agriculture. The chief manufacturing establishment is the Yale & Towne Manufacturing Company, which employs about 2,500 persons. Other manufactures are extracts, typewriting machines, woolen goods, lumber, hats, shoes, machine shop products, pottery, dyestuffs, patent medicines, chemicals, hardware, and wagons and carriages. The government census of 1900 gives the number of manufacturing establishments as 185; the amount of capital invested, $5,189,195; the cost of material used annually, $2,059,725; and the value of the product, $4,743,704. There is an excellent sewerage system and a paid fire department. There are a large city hospital, Saint John's Hospital and Home, and several private sanatoriums. The educational institutions are a high school, nine elementary schools, one parish school, the Catherine Aiken School for girls, the Betts Academy, founded in 1838, for boys; Misses Low and Heywood School, the King School, and the Manor School at Shippan Point. The Ferguson Library is housed in a fine building. The three banks have a combined capital of $602,020; there is also one private bank. The present form of government is administered under a charter which provides for a mayor and a common council, elected biennially in even years. Pop. (1910) 28,836.

STAM'FORD: market-town and municipal borough of Lincolnshire (but partly also in Northamptonshire), England; on the Welland, navigable from S. to the sea; 89 m. n. of London. Portions of the walls and gates of the Carmelite and Franciscan priories, and other curious remains, are still extant. The main buildings are: St. Marys' Church (13th century), All Saints, St. Martin's, St. John the Baptist's (15th century), town hall, corn exchange, assembly and club rooms, literary institute, Browne's hospital (15th century), school and charitable institutions. The manufacture of agricultural implements, and breweries, are the chief sources of industry and trade. Pop. (1901) 8,229.

STAMMER, v. *stăm'mĕr* [Goth. *stamms;* Icel. *stamr;* AS. *stamer*, stammering: Dan. *stamme;* Dut. *stameren*, to stammer]: to utter words with hesitation, and imperfectly; to speak hesitatingly and with difficulty from an impediment in speech; to stutter (see below): N. a difficulty in pronouncing; an impediment in speech; a stutter. STAMMERING, imp.: ADJ. speaking with difficulty: N. a stuttering or imperfect utterance in speech. STAM'MERED, pp. *-mĕrd.* STAM'MERER, n. *-mĕr-ĕr*, one who speaks with difficulty. STAM'MERINGLY, ad. *-lĭ—Stammering* and *Stuttering* are affections of the vocal and enunciative organs, causing hesitancy and difficulty of utterance. The term stuttering is often used synonymously with stammering; but is properly, or at least conveniently, limited to a loose and imperfect action of the organs of articulation; as distinguished from the irregularity of breathing and the convulsive and choking symptoms which invariably accompany stammering. In stuttering, the organs meet and rebound again and again in reiteration of syllables before words can be fully formed. The source of this difficulty is mainly in the lower jaw: when this organ is brought under control, and the effort of speech is transferred from the mouth to the throat—where all voice is formed—the power of fluency is readily obtained. But stuttering is rarely unaccompanied by some degree of spasmodic stammering; and the two forms of impediment, theoretically distinct, are generally blended in mutual aggravation.

Regarding the nature and origin of these defects, opinions have varied. Stammerers themselves often attribute the varying conditions of their impediment to causes purely imaginary, such as the state of the wind, the changes of the moon, etc. The impediment is certainly aggravated by depression of spirits, derangement of digestion, physical debility, etc.; but these influences have nothing to do with the primary cause of the infirmity. A nervous dread of speaking is usually associated with stammering; but this is rather the result than the cause of the impediment. If constitutional nervousness alone were productive of stammering, the number of sufferers would be vastly greater, and it would include a larger proportion of females than of males; whereas the robust sex furnishes by far the greater number of cases; and it is noticeable, besides, that stammerers are not, in general, persons of weak nerves, otherwise than in connection with the act of speaking. Any physical defect will render a person nervous when the peculiarity is made a subject of observation; and in this way only is nervousness associated with speech in cases of stammering. The strength of this impediment—whatever its origin—lies in *habit*, in mismanagement of the breath and of the organs of utterance, rendered habitual before the development of reason and observation and application of the force of will; and its removal depends on the acquirement of voluntary control over the mechanical agents of speech. The nervousness which unfits the stammerer for self direction gradually subsides as his will attains mastery over the processes of speech; and perseverance in a dis-

cipline of systematic and guarded utterance rarely fails to remove the impediment, and the fear which accompanied it.

The first manifestations of stammering take place usually during the weakness attendant on disease, or after a fall or sudden fright; but sometimes the impediment appears to arise from imitation, and children have been known to be infected by even the most casual example. Thus, when one member or visitor of a family stammers, the younger members of the family are very apt to be similarly affected. From this cause defects of speech run so much in families, that stammering has by some authors been deemed hereditary. In the early stages, a little patient direction on the part of parents and nurses would often suffice to check the tendency to stammer, and prevent the habit. Stammering begins generally about the fourth or fifth year of age; but harshness in checking children, or impatience in connection with messages or lessons, may induce it at a considerably later period. Boys of 10 or 11 years have been excited into the habit by injudicious hurry and peremptoriness at school. The little stammerer, when he cannot be more directly assisted, should be kindly counselled to take time and speak slowly; he should never be ridiculed or reproved for what he cannot avoid, and is not taught how to avoid.

The varieties of stammering are so great, that few cases are found precisely alike. In some there is little outward manifestation of effort; in others, the futile attempts are painfully demonstrative. The silent straining to speak causes the eyeballs to protrude, and the veins of the face and neck to swell, till relief from apparent choking comes in fitful, ungovernable bursts of sound. In severe cases the head oscillates loosely on the neck, and is forced upward by the misdirected current of breath; while the larynx, the organ of sound, is from the same cause agitated in continual efforts to ascend, and the voice is consequently abrupt and intermittent, and unnaturally acute. The muscles of the face participate in the general upward action, and sometimes the spasmodic contortions extend over the whole body, causing the stammerer to rock in his chair, or start wildly to his feet. These muscular disturbances arise simply from disordered respiration, and they disappear when the habit of closing the glottis and compressing the organs of articulation is overcome, and the air is allowed to pass freely in or out of the lungs.

Stammering is, in nearly every case, perfectly curable, as it arises seldom from organic defect, but almost always from lack of just co-ordination between the several organs concerned in speech—the muscles of larynx, glottis, tongue, cheeks, jaws, lips, etc. The means of cure must often be continued for a length of time before the stammerer is free from danger of relapse. The best time for the cure is undoubtedly the earliest, before the

habit has acquired full strength, and before the sufferer has endured the most grievous mortifications and drawbacks of the impediment. But the adult stammerer generally brings to the curative task a higher appreciation of its importance, and a greater care and concentration of effort than the child is capable of; and these qualities almost compensate for the disadvantage of long habit. Parents often unwisely defer the attempt to correct impediments of speech, in the hope that the defects will disappear as the child gains strength and reaches riper years; but the hope is rarely realized, and it would have been better to avoid the years of infirmity.

The means proposed for cure of stammering are many and various; and sometimes the 'cure' has been little better than the disease. Drawling, singing, interpolations or elisions of letters, speaking with the teeth closed, or with the tongue pressed to the roof of the mouth, sniffling, whistling between words, beating time to utterance, stamping the foot, jerking the body, forks on the tongue, pebbles in the mouth, bands compressing the larynx, and other absurd devices have been practiced. But the cure depends upon the skilful application of scientific principles, whose only mystery is that which arises from the little attention given to the science of speech.

The habit of stammering can be counteracted only by cultivation of its opposite habit of correct speaking; and this can be acquired only by due regard to the processes of speech, the relation of breath to articulate sounds, the positions of the tongue and other oral organs in molding the outward stream of air; and by patient application of these principles in slow and watchful exercise. The lungs constitute a pair of bellows, and the mouth, in all its varying shapes, the nozzle of the bellows. The passage of the throat must be kept open, and the breath expelled by means of the ascent of the diaphragm, not by downward pressure of the chest. All sound originates in the throat, and all effort in speech much be thrown back behind the articulating organs, which must be kept *passive*, yielding to the air, always opening to give it exit, and never resisting it by ascent of the tongue or of the jaw. The head must be held firmly on the neck, to give free play to the attached organs; and the great principle must never be lost sight of that *speech is breath;* and that, while distinctness depends on precision and sharpness of the oral actions, *fluency* depends on the unrestricted emission of the material of speech—the air that we breathe.

Defective Speech in General.—Besides stammering and stuttering, there are many other forms of vicious articulation, which are rather defects than impediments of speech. The elementary sounds most subject to mispronunciation are those of *r* and *s*, giving rise to the common defects of burring and lisping. Burring consists in vibrating the uvula or the edge of the soft palate,

instead of the tip of the tongue; and lisping consists in applying the tongue to the teeth or the gum, thus intercepting the breath, and forcing it over the sides instead of the center of the tongue. The sound of *l* also is often defective, *w, y, ng,* or a *vowel* being substituted for the lingual articulation. Other substitutions of one element for another are common, such as *t, d,* and *n,* for *k, g,* and *ng; s* or *z* for *th; s* for *sh;* etc. There are defects also which arise from organic malformation, and require the aid of surgery; as when fissure exists in the palate, and the breath cannot be inclosed behind the lips or tongue, but escapes into the nostrils; when the tongue is too closely tied to the bed of the mouth, and the tip cannot be raised to the palate; when the teeth are so irregular or abnormally numerous as to leave the tongue too little room to act; etc. In some cases the breath escapes into the nostrils when there is no organic cause for the peculiarity, and *r, l, s,* and other elements are nasally affected, merely from habit. The nasal passages are in other cases insufficiently free, and *m, n,* and *ng* are scarcely distinguishable from *b, d,* and *g.*

There are comparatively few persons who have perfect command over their vocal organs. Speaking, which is in reality an art, is exercised only as an instinct; and thus, as Dr. Rush observes, 'some men only bleat, bark, whinny, or bray a little better than others.' It is some consolation to those who have been compelled by their defects to study the art of speech, that they exercise this crowning function more worthily than others, and thus acquire, perhaps, a better utterance than they would have had without the stimulus of impediment.

Speaking, when the respiration is properly conducted, is one of the most healthful exercises; but violent or long-continued effort is injurious to the chest, when the lungs are not kept well inflated. Frequently, also, under such circumstances, the vocal cords become permanently relaxed, and total loss of voice sometimes ensues.

The acquirement of the power of speaking in infancy is dependent on the possession of hearing, so that deaf children are also mute. Under proper training, however, they may be taught to articulate, as the organs of speech are very rarely imperfect. Children who have been subject to fits or other cerebral affections, or who are deficient in imitative power, are sometimes very backward in learning to speak. In such cases great care is requisite to direct the early attempts and prevent the formation of bad habits. Many of the worst forms of defect and impediment owe their origin simply to lack of proper direction in the production of elementary sounds, when the little sufferers have failed to enounce them correctly by natural imitation.

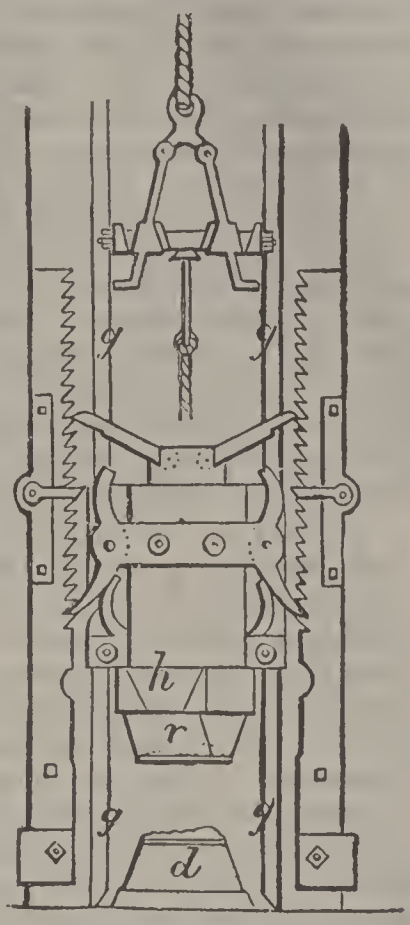
STAMP, n. *stămp* [Icel. *stappa,* to stamp, to thrust with a pole: Norw. *stampa,* to tramp in mud: Dut. *stampen,* to ram, to pound: Ger. *stampfen,* to stamp]: tool or

instrument for making impressions or marks on substances, generally of figures or devices (see MINT); the mark impressed; a thing marked or stamped: in *taxation*, small piece of paper having a certain value impressed by government, used for attaching to a paper, letter, or document liable to duty, known as STAMP-DUTY; used also in the United States, by law, to be attached to a few special kinds of goods subject to revenue tax—notably tobacco, cigars, beer, whisky: instrument for cutting or shaping material into any required form by a blow or pressure (see STAMPING OF METAL): authority; make; cast; character; current value: V. to strike or beat forcibly, as with the bottom of the foot; to strike the foot downward; to impress with a mark or figure; to put a government stamp on; to fix deeply, as on the mind; to coin; to cut into forms by a stamp; to crush by downward pressure, as ore in a stamping-mill; in *OE.*, to form; to mint. STAMP'ING, imp.: N. the act of one who or that which stamps. STAMPED, pp. *stămpt.* STAMP'ER, n. *ĕr*, one who or that which stamps. STAMPING-MILL, a mill for pounding ores (see METALLURGY). OF THE RIGHT STAMP, possessed of genuine merit.

STAMP ACT: specific name of a statute in Great Britain of 5 and 6 William and Mary, c. 21, by which taxes were imposed on all parchment and paper whereon private deeds and other legal instruments were written: its details have been altered by subsequent legislation, but its principle is still in effect.—The stamp act, noted in U. S. colonial history, was an act of the British parliament 1765, Mar. 22, requiring that every written agreement in the American colonies should bear a stamp. George Grenville, chancellor of the English exchequer, proposed a bill for taxing the colonies through a stamp duty. No serious opposition was expected. But the measure aroused great excitement in America as an attempt at taxation without representation. In the United States a stamp act congress, consisting of delegates from all the colonies except New Hampshire, Virginia, North Carolina, and Georgia, met at New York 1765, Oct. 7, and adjourned Oct. 25. The action of this congress consisted of an address to the king, petitions to parliament and a declaration of the rights and grievances of the colonies. It protested that the colonies could only be taxed by their own representatives in the colonial assemblies; claimed the inherent right of trial by jury, and declared the stamp act to have a manifest tendency to subvert the rights and liberties of the colonies. The act was repealed within a year.

STAMPEDE, n. *stăm-pēd'* [Sp. *estampido*, a crash: Dut. *stampen*, to stamp the ground with the feet (see STAMP)]: a sudden fright seizing large bodies of horses or cattle, and causing them to run furiously; any sudden flight arising from a panic: V. to take to sudden flight; to cause to take to sudden flight.

STAMPING OF MET'AL: operation in various mechanical departments. For the stamping of coins or medals, see MINT: for preparation of the dies used, see DIE-SINKING. For ordinary stamped brass-work a stamping-machine is employed, of which the essential parts are a *die*, a *reverse* or counter-die, and a *hammer*. It is shown in the annexed figure; but the toothed rack, with arrangement for catching the hammer after it rebounds, is used only for special purposes. The die, *d*, of cast-iron or steel, is fixed to the bottom of the stamp, and the reverse, *r*, is attached to the hammer, *h*, which works between two guides, *g*, *g*. Pieces of thin rolled brass are cut to size, and one is placed upon the die; the hammer, with the counter-die, is now raised to sufficient height by a windlass and rope, or other means, and allowed to fall, and thus force the thin plate into the die. The plates from the first blow are then annealed. Repeated blows and annealings follow until the article is 'brought up,' slight alterations in the reverse being from time to time required. Sometimes as many as 30 blows are necessary, but 10 or 12 strokes will suffice for an object with considerable depth of stamping. Globular articles are stamped in two or more pieces, and then soldered together.



Stamping-machine.

The stamping process was adapted to the production of hollow shapes in sheet-iron 1841, and since then the manufacture of such goods as dish-covers, basins, teapots, bowls, pans, kitchen-utensils, etc., has been surprisingly improved and extended. The stamping-machine with hammer action, however, is now generally superseded by the 'stamping-press,' in which the work is done by continuous pressure, exerted by a screw, a toggle-joint, or the like. For stamping-machines used in dressing metallic ores, see METALLURGY.

STANCE, n. *stăns* [OF. *estance*, a station—from mid. L. *stantĭa*, a house, a chamber—from L. *sto*, I stand]: in *Scot.*, a site; an area for the erection of a building.

STANCH, v. *stânsh* [OF. *estancher*, to stop the flow of a liquid—from mid. L. *stancārĕ*, to stop the flow of blood, a variant of L. *stagnārĕ*, used in the same sense (see STAGNATE): Sp. *estancar*, to stop a leak; *stanco*, water-tight: Bret. *stanka*, to stop a hole: Prov. *estanc*, firm, stable]: to stop the flowing of blood; to cease to flow, as blood: ADJ., also STAUNCH, *stânsh*, sound; firm; steady; sound and

strong; strong and firm in principle; not to be broken, constant; zealous; strong, as a dog following the scent without error. STANCH'ING, imp. STANCHED, pp. *stânch't.* STANCH'LESS, a. *-lĕs*, that cannot be stopped or stanched STANCH'ER, n. *-ėr*, one who or that which stanches. STANCH'LY, ad. *-lĭ*, firmly. STANCH'NESS, n. *-nĕs*, firmness; steadiness; soundness.

STANCHEL, n. *stăn'shĕl:* the same as STANCHION.

STAN'CHIO, or STAN'KO: see COS.

STANCHION, n. *stăn'shŭn*, or STANCHEL [OF. *estançon*, a prop; *estance*, a station, a stanchion—from L. *sto*, I stand: W. *ystanc*, a holdfast]: prop or upright support. Stanchions in the form of upright iron bars are often fixed in the stone-work to protect windows; sometimes let into the stone at top and bottom; sometimes at bottom only, and ornamented with fleurs-de-lis, etc., at top.

STAND, n. *stănd* [AS. *standan, stondan;* Goth. *standan;* Icel. *standa*, to stand: Dan. *stade*, stand, station: L. *stans*, standing; *sto*, I stand: Skr. *sthâ*, to stand]: a point beyond which a person does not, or cannot, proceed; a place in which to remain for any particular purpose; a station; a difficulty or perplexity; a stop; a halt; that on which a thing rests or is laid; a building or scaffolding placed to command a view, as of a procession or horse-race; a state of cessation from action or business: V. to be in an upright position, as on the feet; to be erect; to become erect; to be placed or situated; to be in a particular relation, as to *stand* as godfather; to depend; to rest; to stop; to halt; to continue; to remain; to endure; to succeed; to persist; to insist; to maintain one's ground; not to fail; not to yield or fly; to offer one's self as a candidate; to place one's self; to stagnate; to withstand; to await; to abide; in *slang*, to pay for, as to *stand* a treat; in *OE.*, to have a place; to be resolutely of a party; to remain satisfied. STAND'ING, imp.: ADJ. continuing erect; not cut down; settled; fixed; established; not transitory; not flowing; not cast down: N. rank or station, as a man of *standing;* continuance; long possession; place; power to stand; station; a place to stand in. STOOD, pt. and pp. *stûd.* STAND'ER, n. *-ėr*, one who stands. A STANDER-BY, a mere spectator; one present. A STAND STILL, inability to move. TO STAND AGAINST, to oppose; to resist. TO STAND BY, to be near; to defend; to support. TO STAND FAST, to be unshaken or immovable. TO STAND FIRE, to receive an enemy's fire without giving way. TO STAND FOR, to offer one's self as a candidate; to side with; to maintain; to be in the place of; to represent; to sail toward. TO STAND FROM, to sail away from. TO STAND IT, stoutly to endure; to maintain one's ground. TO STAND OFF, to keep at a distance. TO STAND OFF AND ON, to sail toward land and then from it, as a ship. TO STAND ON, to continue on the same tack or course. TO STAND ONE'S GROUND, to maintain one's station or position. TO STAND OUT, to project, as from a wall; to resist; to sail from land TO STAND TO, to persevere; to abide by; to be consistent with, as to *stand* to one's word. TO STAND TOGETHER, to be consistent; to agree. TO STAND TO SEA, to direct the

course from land. To STAND UP, to rise from a sitting position. To STAND UP FOR, to justify; to support. To STAND UPON, to value; to pride one's self on. To STAND WITH, to be consistent. IT STANDS TO REASON, a familiar phrase, meaning, 'it could not reasonably be otherwise' To MAKE A STAND, to halt for the purpose of offering resistance to an enemy, or in a matter of duty or principle. To PUT TO A STAND, to embarrass; to perplex. A STAND OF ARMS, a firearm with its customary appendages, as bayonet, etc. STANDPOINT, a fixed point or station; a position from which a matter may be viewed. STAND-UP, a. manfully contested, as a *stand-up* fight. BYSTANDER, one standing near; a mere spectator. STANDING ORDERS, rules for conduct of business in a legislative body (see below). —SYN. of 'stand, n.': station; place; rank; post; stop, halt; interruption; point; perplexity; embarrassment; hesitation; difficulty; rest; obstruction.

STANDARD, n. *stănd'ĕrd* [OF. *estandart;* It. *stendardo*, a standard—from OHG. *standan*, to stand]: *formerly*, a lofty pole borne in a car or fixed in the ground, marking the headquarters of an army, and usually bearing a flag with suitable devices; an upright without a flag; a staff and flag; the colors; an ensign (see below): that which is established by government as a rule, measure, or model; settled rate; fixed value; a test: that which is of undoubted excellence: standing tree or stem, as distinguished from a wall-tree; in *carpentry*, an upright support; the quarters or upright posts in wooden partitions; *door-standards* are the upright timbers to which doors are hung: in *ship-building*, an inverted knee placed upon the deck instead of beneath it: in *coinage*, the proportion of weight of fine metal and alloy established by authority (see ALLOY: MINT): ADJ. having a fixed and permanent value; not of the dwarf kind, as a tree. STANDARD-BEARER, in *mil.*, officer who bears a standard. STANDARD TIME (see HOROLOGY).—SYN. of 'standard, n.': ensign; flag; streamer; banner; pennant; criterion; rule; test.

STAND'ARD: in its widest sense, a flag or ensign under which men are united together for some common purpose. The use of the S. as a rallying-point in battle dates from remote ages. The Jewish army was marshalled with the aid of standards belonging to the four tribes of Judah, Reuben, Ephraim, and Dan; and the Egyptians had ensigns with representations of their favorite animals. The flag of Persia was white, and according to Xenophon, bore in his time a golden eagle with expanded wings; it was fixed on a chariot, and thus conveyed to the field of battle. Æschylus, in enumerating the six chiefs who, headed by Polynices, set themselves in battle array against Thebes, describes the device on the standard of each. In the earliest days of Roman history, a bundle of hay or fern is said to have been used as a military S., which was succeeded by bronze or silver figures of animals, on a staff, of which Pliny enumerates five—the eagle, the wolf, the minotaur, the horse, and the boar. In the second consulship of Marius, B.C. 104, the other animals were laid aside, and only the eagle retained; and

till the time of the later emperors, the eagle, often with a representation of the emperor's head beneath it, continued to be carried with the legion. On the top of the staff was often a figure of Victory or Mars. Each cohort had also an ensign of its own, consisting of a serpent or dragon woven on a square piece of cloth, and elevated on a gilt staff with a cross-bar. Under the Christian emperors, the *Labarum* (q.v.) was substituted for the imperial S. Various standards of great celebrity occur in mediæval history, among which are the Flag of thr Prophet (q.v.); the S. taken from the Danes by Alfred of England; and the Oriflamme, belonging originally to the Abbey of St. Denis, and borne by the Counts of Vexin, which eventually became the S. of the French kingdom.

In strict language, the term is applied exclusively to a particular kind of flag, long in proportion to its depth, tapering toward the fly, and, except when belonging to princes of the blood-royal slit at the end. Each baron, knight, or other commander in feudal times, had a recognized S., which was distributed among his followers; the length varied according to the rank of the bearer. A king's S. was 8 to 9 yards in length; a duke's, 7 yards; a marquis's, 6½ yards; an earl's, 6 yards; a viscount's, 5½ yards; a baron's, 5 yards; a banneret's, 4½ yards; and a knight's, 4 yards. There was never a complete coat-of-arms on the S.; it generally exhibited the crest or supporter with a device or badge of the owner, and every English S. of the Tudor era had the cross of St. George at the head. Standards were registered by the heralds, and the charges on them selected and authorized by an officer of arms. The so-called Royal S. of Great Britain is more properly a Banner (q.v.), being a square flag with the national arms covering the entire field without any external accessories. The so-called cavalry standards in use in the British army are also in strictness banners.—In the United States army every mounted regt. has a standard of silk bearing the national arms on a blue ground, with the number of the regt. beneath the eagle.—See FLAG: BANNER: COLORS, MILITARY: ENSIGN.

STAND'ARD, BATTLE OF THE: between the English and Scots, on Cutton Moor near Northallerton, 1138, Aug. 22. On the usurpation of Stephen, David I. of Scotland, who, with Stephen, had sworn to defend the rights of Matilda, daughter of Henry I., invaded England in pursuance of his oath, and compelled the barons of the n. part of the kingdom to swear fealty to that princess. After a war of nearly three years David met the English troops at Cutton Moor. His large but undisciplined army, partly in consequence of a rumor that the king was slain, were thrown into confusion, and the most disastrous rout followed, in which the Scots are said to have lost 10,000 men. The battle was named from the fact that a ship's mast, elevated on a wagon, and bearing on its top the consecrated host, and surrounded by the banners of St Peter of York, St. John of Beverley, and St. Wilfred of Ripon, marked as a standard the centre of the English army.

STANDING ORDERS: permanent regulations for conduct of business in a legislative or a deliberative body. In the British house of commons the S. O. are held to be in force from parliament to parliament unless rescinded; in the U. S. house of representatives each new house establishes its own S. O. or rules: in the U. S. senate the rules are in force continuously until repealed. The time of debate is limited in the U. S. house of representatives by the 'previous question;' no such rule exists in the senate. In the British house of commons there was no standing order for limiting debate till 1887, when the rule of 'closure' was adopted, according to which a debate may be ended and the main question put to vote.

STANDING STONES: large rude unhewn blocks of stone, artifically raised to an erect position at some remote period, have been found in almost every region inhabited by man—in Britain, continental Europe, Assyria, India, Persia, n. Africa, Mexico; and they are generally of such size that their erection must have required some skill in the use of mechanical power. They are abundant in Brittany and in the British Isles, where they stand sometimes singly, sometimes in more or less regular groups; and it was long the general opinion of archeologists that they were connected with the Druidical worship of the Celtic races. Modern investigation has thrown doubt on the Druidical theory, yet no other explanation has been given which is in all cases satisfactory. The erection of a large stone not easily shifted from its place is perhaps the earliest mode which man's instinct would contrive of preserving the memory of an event or of a hero; and there can be no doubt that many of these monoliths mark the site of a grave or of a battlefield. Human skeletons, and bronze and iron weapons, have in numerous cases been found underneath them. A traditional remembrance of this origin is preserved in the name 'Cat Stane' [from Celtic *cath*, battle], given to some of them in Scotland, and 'bauta stein' (battle stone) in Norway. Another possible purpose is preserved in the Scottish name of 'hair stane' or boundary stone, by which they are occasionally known; not a few of them, whatever their original object, having been long used as landmarks, and being alluded to as such in very early charters. A third use of these monoliths is at least as old as the historical books of the Old Testament. We read in Judges ix. 6, of Abimelech being made king 'by the pillar which was in Shechem;' and in II. Kings xi. 14, of Joash, when he was anointed king, standing 'by a pillar, as the manner was;' and a like usage prevailed in ancient Britain, where the king or chief was elected at the 'Tanist stone' [from *Tanist*, the heir-apparent among the Celts], and there took a solemn oath to protect and lead his people. A very celebrated stone of this kind was the Lia Fail of Ireland, brought to Icolmkill for the coronation of Fergus Ere; which after being removed to Scone, became the coronation stone of Scotland, till conveyed by Edward I. to Westminster, where it now forms part of the coronation chair of the sovereigns of the United Kingdom. In

all these cases there is an idea of a solemn religious sanction attached to the stone; and a peculiar degree of sacredness seems to have invested any contract entered into at one of these perforated stones which are or were occasionally seen in England and Scotland. Such a stone, with an oval hole large enough to admit a man's head, till within recent years adjoined the monolithic group of Stennis in Orkney; it was known as the 'Stone of Odin,' and till the middle of the 18th c. was the scene of the interchange of matrimonial and other vows—he who broke the vow of Odin being accounted infamous. It is said to have been the popular belief that any one who had in childhood been passed through the opening would never die of palsy. The power of curing rheumatism was ascribed to a perforated stone at Madderty in Cornwall. While many of the monoliths in Britain are undoubtedly of very remote age, there are some indications that the practice of erecting them continued for a time after the introduction of Christianity, and that they were used to subserve purposes connected with the new faith.

Still more puzzling to archeologists than the single monoliths are the large symmetrical groups of them, of which the most remarkable are Stennis in Orkney, Stonehenge and Avebury in Wiltshire, and Carnac in Brittany; all which, till lately, existed comparatively entire, though they all have been more or less despoiled for building purposes. The most imposing of these monuments is Stonehenge (q.v.). At Stennis, 70 to 80 stones were grouped in two separate circles of 360 and 100 ft. diameter respectively, the larger stones being in the smaller circle. At Avebury, two double concentric circles were surrounded by an outer circle of 100 stones, the whole being approached by two long avenues of stones in double lines. In all these, and other instances, the circles were surrounded by a trench and mound. At Carnac the stones are not in circles but in straight lines, with a curved row at one end—an arrangement which has suggested the idea of a burial-place on the site of a great battlefield. All around Carnac, as well as Stonehenge, Barrows and Cromlechs (q.v.—see also DOLMEN) are found. While the popular notion of all these monuments is that they were Druid temples, the circular form so frequent among them has suggested also that they may originally have been connected with sun-worship: it is possible that they may have been used in turn for the successive religious worship of different races. They seem also to have served the purpose of courts of justice, or battle-rings for the duel and judicial combat. See STONEHENGE.

A remarkable kind of monument, whose purpose is utterly unknown, is the *Rocking-stone* or *Logan-stone* (q.v.). For a notice of a class of standing stones ornamented with peculiar sculpture and found largely in Scotland, see SCULPTURED STONES.

STANDISH, n. *stănd'ish* [from STAND and DISH, which see]: a case for pens and ink: an inkstand.

STANDISH, *stănd'ish*, MILES: 1584 (?)—1656, Oct. 3; b. Lancashire, England: Pilgrim captain. He is thought to have been of the old S. family of Duxbury Hall, of whom two Sir John S.'s were distinguished soldiers. While on army service in the Netherlands, he became attached to the Pilgrim band, and with them sailed in the Mayflower, 1620. Five days after arrival, he began a series of explorations in the vicinity with a few armed men. In 1621 he explored Massachusetts Bay. In 1622 he rescued a colony at Weymouth, decoying and killing two hostile chiefs by Massasoit's advice, and terrifying the Indians in a battle ensuing. He went to England on a mission for the relief of the Plymouth colony 1625. Three years afterward he arrested Thomas Morton (an adventurer who had planted a riotous settlement at 'Merry Mount,' now Braintree) for instructing Indians how to use firearms. He failed, 1635, to drive away from Penobscot the French, who had driven away a Plymouth company. In 1632 he settled with a few Pilgrims at Duxbury, and, though not a church-member, was elected to town and colonial offices. His wife Rose died 1621; and he married her sister Barbara after the failure of his proxy courtship of Priscilla Mullens. He left 4 sons. He was a brave, useful man, and his monument, 100 ft. high, with statue, stands in Duxbury on Captain's Hill, where his house stood, and where he is supposed to have been buried.

STANFIELD, *stăn'fēld*, WILLIAM CLARKSON: marine painter: 1794–1867, May 18; b. Sunderland, England. In youth he went to sea, and made frequent long voyages as a common sailor—passing some years in the China seas. Capt. Marryat, who met him in the Mediterranean, serving in a king's ship as captain's clerk, observed his gift for drawing and painting. S., having left the navy in consequence of an injury to his feet through a fall from the foretopgallant masthead of his ship, took to scene-painting as a means of earning his bread. His first efforts were in the Old Royalty, a sailors' theatre in Wells Street, Wellclose Square, in the e. end of London, about 1818. He was afterward employed at Drury Lane Theatre, where, it is said, he produced some of his most extraordinary effects. He carried on this occupation for about nine years, meanwhile not neglecting easel-painting. The first picture by him that attracted considerable notice was *Market-boats on the Scheldt*, exhibited at the Brit. Institution 1826. The picturesque grouping, variety of figures, and gay costumes were much admired. His *Wreckers of Fort Rouge, Calais*, 1827, also at the Brit. Institution, was even more successful. In 1828 he obtained from the Institution a prize of 50 guineas for another of his pictures. In 1830 S. made his first excursion on the continent, and exhibited at the Acad. his *Mount St. Michael, Cornwall*, which placed him in the front rank of marine painters. In 1823 S., with David Roberts and others, founded the Soc. of Brit. Artists. His election to the Acad. as associate was in 1832, and 1835 he was chosen R.A. In 1833 S. exhibited at the Acad. the first of a series of pictures of Italian scenery,

painted for the Marquis of Lansdowne. In 1834 he began a similar series for the Duke of Sutherland. In 1836 he exhibited *The Battle of Trafalgar,* painted for the Senior United Service Club; and 1841 his celebrated *Castello d'Ischia,* engraved by the Art-union 1844. In 1843 he sent to the Acad. *Mazerbo and Lucello, Gulf of Venice,* said to be one of his finest landscapes. *A Skirmish off Heligoland* (1867) was Stanfield's last contribution to the Academy. His great merit is in skilful combination of land and sea in the same view. Man and the works of man are not omitted, and there is frequently a high poetic feeling in his conceptions, as in his pictures of *The Abandoned* and *The Wreck of a Dutch East Indiaman.* His pictures, never quite losing the scenic touch, are effective in composition, and both artistic and powerful in handling.

STANFORD, *stăn'fĕrd,* JANE LATHROP: American philanthropist: b. Albany, N. Y., 1825, Aug. 25; d. Honolulu, Hawaiian Isl., 1905, Feb. 28. She was married to Leland Stanford and after his death, in 1893, was occupied chiefly in fostering the development and extension of Leland Stanford Jr. University, which she had aided her husband to establish in memory of their son. In 1901 she increased her gifts to the university by further gifts of securities valued at $18,000,000; her residence in San Francisco, valued at $400,000, for a museum and art gallery; and 1,000,000 acres of land valued at $12,000,000. She subsequently added other benefactions, thus making the university the wealthiest educational institution in the world. Mrs. Stanford established the children's hospital at Albany, N. Y., at a cost of $100,000, and provided an additional $100,000 to secure its maintenance; she likewise gave over $160,000 to various schools and kindergartens. See LELAND STANFORD JR. UNIVERSITY.

STANFORD, LELAND: financier: 1824, Mar. 9—1893, June 20; b. Watervliet, N. Y. He was brought up on a farm; studied law, was admitted to the bar, and began practicing in Port Washington, Wis., 1849; lost his law library and other property by fire 1852; and, removing to California, became associated in business with his brothers, who had preceded him to that state, and acquired a great fortune. In 1860 he was a delegate to the national republican convention; 1861 was elected governor of California and president of the Central Pacific Railroad Company; 1869, May, drove the last spike in the railroad constructed over the Rocky Mountains; 1885 was elected U. S. senator; and 1891, Jan., was re-elected. As a memorial to his deceased son, he erected at Palo Alto the 'Leland Stanford Junior University'—endowed by him with $20,000,000, and designed to provide the usual collegiate courses, together with a large variety of practical branches of education

for both sexes. The corner-stone was laid 1887, May 14, and the university was formally opened 1891, Oct. 1.

STANG, n. *stăng* [Icel. *stöng;* Dan. *stang,* a bar, a staff: Icel. *stanga,* to strike with the horns, to goad]: an instr. of thrusting; a long bar or wooden pole; an old measure of land. To RIDE THE STANG, to be mounted on a strong pole, borne on men's shoulders, and carried about from place to place—a kind of lynch law formerly inflicted on wife-beaters, henpecked husbands, etc.

STANHOPE, *stăn'op,* Lady HESTER LUCY: 1776, Mar. 12—1839, June 23; b. Chevening, in Kent; eldest daughter of Charles, third Earl Stanhope (1753-1816), and his wife Hester, daughter of the great Lord Chatham. She grew up to be a woman of great personal charm and of unusual force and originality of character, inheriting her father's impetuosity and honest uncompromising directness, with the domineering tendency of her grandfather, the first Lord Chatham. Very early she went to reside with her uncle, William Pitt, and as mistress of his establishment, and his most trusted confidante during his season of power and till his death, she had full scope for the exercise of her imperious and queenly instincts. On the death of Pitt, a pension of £1,200 a year was assigned her by the king. Mr. Fox proposed to provide for her much more munificently, but she proudly declined his offers, as unwilling to accept benefit at the hands of the political enemy of her dead uncle. The change from the excitements of a public career, as it might almost be called, to the life of an ordinary woman of her rank with means somewhat insufficient, was naturally irksome; and 1808 she was tried still further by the death, at Coruña, of her favorite brother Major Stanhope, and of Sir John Moore, for whom she is known to have cherished an affection. The precise relations between them have never been made known; but the last words spoken by the dying hero were: 'Stanhope' (a Capt. Stanhope of his staff, who stood by him), 'remember me to your sister.' Conceiving a disgust for society, Lady Stanhope retired into Wales, and 1810 she left England, never to return. In mere restlessness of spirit she wandered for a year or two on the shores of the Mediterranean, and finally settled among the semi-savage tribes of Mt. Lebanon. Here she led the strangest life—adopting in everything the eastern manners, and by her force and fearlessness obtaining marvellous ascendency over the rude races around her. She was regarded by them with superstitious reverence as a sort of prophetess, and gradually came so to consider herself. With the garb of a Mohammedan chieftain, she adopted something of the faith of one, and her religion, which seems to have been sincere, was compounded in about equal proportions of the Koran and the Bible. Her recklessly profuse liberalities involved her in constant

straits for money; and her health also giving way, her last years were passed in wretchedness of various kinds, under which, however, her untamable spirit supported her bravely to the end. She died at her lonely villa of Djoun, 8 m. from Sidon, among her more than a score of oriental servants, but with no Frank or European near; and was buried in her own garden.

STAN'HOPE, PHILIP DORMER, fourth Earl of Chesterfield. See CHESTERFIELD, EARL OF.

STAN'HOPE, PHILIP HENRY, Earl: historian and biographer: 1805-1875, Dec. 24; b. Walmer; only son of the fourth Earl Stanhope, representative of a branch of the family of the Stanhopes, earls of Chesterfield, whose founder, a distinguished diplomatist in the reigns of William III. and Queen Anne, was son of the first Earl of Chesterfield. James, first Earl Stanhope, was eminent military commander, who effected the reduction of Port Mahon, in the island of Minorca, and was the favorite minister of George I. His grandson, third earl, distinguished for scientific researches, and inventor of a printing-press which bears his name, died 1816. The subject of this notice, whose courtesy-title was Viscount Mahon, received a private education, but graduated at Oxford, where he took his B.A. degree 1827; created D.C.L. 1834. He entered the house of commons 1830. He was a moderate conservative in politics, and was warmly attached to Sir R. Peel, who named him one of his literary executors. His contributions to history are numerous and valuable. His most considerable work is *A History of England from the Peace of Utrecht to the Peace of Versailles,* 1713-83, in 7 vols. His other works include a *Life of the Right Hon. W. Pitt;* a *History of Spain under Charles II.;* a *Life of the Great Condé* (written originally in French); a *Life of Belisarius; Historical and Critical Essays;* and *Miscellanies.* With the Right Hon. E. Cardwell, he edited the *Memoirs of Sir R. Peel.* He was elected lord rector of the University of Aberdeen 1858.

STANIEL, or STANYEL, n. *stăn'yĕl:* in *OE.,* a base or inferior kind of hawk; probably a corruption of *stone-gall,* another name for the same bird. STANIELRY, n. *stăn'yĕl-rĭ,* ignoble falconry.

STANISLAS, *stăn'ĭs-las* (or STAN'ISLAUS), AUGUSTUS, last King of Poland. See POLAND, PONIATOWSKY, JOSEPH ANTON.

STANK, n. *stăngk* [OF. *estang*—from L. *stagnum,* a pool of standing water: Gael, *stang,* a pool, stagnant water]: in *Scot.,* a pool; a pond; an open sewage conduit.

STANK, v. *stăngk:* pt. of STINK, which see.

STANK, or STANCK, a. *stăngk* [It. *stanco,* fatigued, wearied]: in *OE.,* weak; worn out; weary.

STANLEY, *stăn'lĭ,* ARTHUR PENRHYN, D.D.: an emi-

nent scholar, author, and theologian of the Church of England: 1815, Dec. 13—1881, July 18; b. Alderley (where his father was then rector); son of Edward S., D.D., Bishop of Norwich, and nephew of Baron Stanley of Alderley; of a branch of the same family with the earls of Derby. Educated at Rugby under the care of Dr. Arnold, he passed (1834) as an exhibitioner to Balliol College, Oxford, where he achieved a brilliant reputation, winning the Ireland scholarship, and taking a first-class in classics (1837), the Latin essay prize (1839), and the English essay and theological prizes (1840). In 1838 he was chosen a fellow of University College, of which he was tutor and examiner for many years. Appointed canon of Canterbury (1851), prof. of ecclesiastical history at Oxford, canon of Christ-Church, and chaplain to the bishop of London (1858), he succeeded Abp. Trench 1864 as Dean of Westminster. He was also chaplain to the queen. In 1874 he was elected rector of St. Andrews University. His wife, daughter of the Earl of Elgin, died 1876. In 1862, he accompanied the Prince of Wales to Egypt and the Holy Land.—During his professorship at Oxford he sought to mediate between the theological factions, then excited by such opinions as those promulgated in the famous volume of *Essays and Reviews.* His position may be seen in his *Essays on Church and State;* which, however, were offensive to the high church party, who demanded a formal condemnation of the Jowett and Temple *Essays.* He had sought toleration also for Prof. Frederick D. Maurice, and now for Bishop Colenso; and about the same time, 1863, advocated a less strict subscription to the 39 articles. After becoming Dean of Westminster, he showed his liberality by favoring the monument in the abbey to the brothers Wesley, by his invitation to the Bible revisers of every faith to the holy communion, by recommending that ministers of all Christian denominations be admitted to Anglican pulpits, and by urging that the recital of the Athanasian creed be optional. He looked forward to a 'catholic, comprehensive, all-embracing Christianity,' and insisted especially on exaltation of primary and essential doctrine at the expense of technicalities, historic confessions, and ritual. Himself holding firmly to fundamental truths and profoundly reverencing the Bible (exhorting, indeed, to its more diligent study), he found the great miracle of revelation chiefly in its moral and spiritual verities. Meanwhile his zeal was expended not merely in religious directions, but also he cared for the working classes in every grade, from high to low. His congregations increased, his eloquence attracted all, and his frankness and large social gifts made his friends innumerable, though on strict ecclesiastical grounds he had strong opponents. Such was the leading liberal theologian of the Church of England, and his books testify to the fulness of his learning, the freshness and

glow of his mind, his literary genius, and his power of word-painting; and his hymns reveal the grace and tenderness of his spirit.—Dean Stanley, through his later years, had been the recognized leader of the 'broad church' company. He was buried in the abbey which he loved so well.—His principal writings, besides his contributions to reviews and to Smith's classical dictionaries, are the *Life of Dr. Arnold* (1844); *Sermons and Essays on the Apostolical Age* (1846); *Memoir of Bishop Stanley* (1850); *The Epistles to the Corinthians* (1854); *Sinai and Palestine* (1855); *The Unity of Evangelical and Apostolical Teaching* (1859); *Lectures on the Eastern Church* (1861); *Lectures on the Jewish Church* (1863-65 and 76); *Sermons Preached before the University of Oxford* (1860-63); *Historical Memorials of Westminster Abbey* (1867); *The Three Irish Churches* (2d ed. 1869); *Essays on Church and State* (1870); *The Athanasian Creed* (1871); *Lectures on the Church of Scotland* (1872); a work on the Utrecht Psalter (1874); *Christian Institutions;* etc.

STAN'LEY, DAVID SLOANE: soldier: b. Chester, Wayne co., O., 1828, June 1; d. 1902. He graduated at the U. S. Military Academy, and was appointed brevet 2d lieutenant 2d U. S. dragoons 1852. In the regular army he was promoted 2d lieutenant 1853; 1st lieutenant 1st cavalry 1855; captain 4th cavalry 1861; major 5th cavalry 1863; colonel 22d infantry 1866; and brigadier general 1884, Mar. 24; and brevetted lieutenant colonel 1862 for Stone River; colonel 1864 for Resaca; and brigadier general and major general 1865 for Ruff's Station and Franklin. In the volunteer army he was commissioned brigadier general 1861, Sep. 28; promoted major general 1862, Nov. 29; and mustered out of the service 1866, Feb. 1. Nearly all of his military life was passed on duty among the Indians, and it is said that he had dealings with almost all the tribes in the Mississippi and Rio Grande valleys, having served in or had command of departments from North Dakota and Montana to New Mexico and Texas.

STAN'LEY, The Right Hon. EDWARD HENRY SMITH; the 15th Earl of Derby: eminent English statesman: 1826, July 21—1893, Apr. 21; b. Knowsley Park, Lancashire; eldest son of the fourteenth Earl of Derby. He was educated at Rugby; and at Trinity College, Cambridge, where he concluded a distinguished university career by taking a first-class in classics 1848, with a declamation prize and mathematical honors. He early adopted the profession of statesmanship, and applied himself especially to study of social and economical questions. During his absence on a tour in Canada, the United States, and the West Indies, he was elected (1848, Dec.) M.P. for King's Lynn, on the death of Lord G. Bentinck. He visited the East, and was still in India

when his father received the queen's command to form an administration, in which Stanley was appointed under-sec. for foreign affairs. In 1858 he was appointed to the secretaryship of the colonies in Lord Derby's administration, and was soon called to succeed the Earl of Ellenborough as president of the board of control for the affairs of India. The great Indian mutiny had not yet been quelled, and it devolved on Stanley to frame resolutions and bring in a bill abolishing the East India Company, and transferring their Indian possessions to the direct government of the crown: this he performed with consummate ability. The great mutiny was put down during his secretaryship, and 1859, Feb., he had to meet the financial disorganization which it bequeathed. The Derby government resigned before Stanley could carry out his plans for the finances of India; but he gave effective support to his successor in measures of administrative improvement. In his father's third administration, formed 1866, July, he was secretary of state for foreign affairs, and gained much popularity by his ability and tact in negotiations for the settlement of the Luxemburg difficulty. He continued in this office till the accession of the Gladstone ministry to power 1868. He was installed lord rector of the Univ. of Glasgow 1869, Apr.; and in Oct., on the death of his father, he took his seat in the house of lords. He was again made foreign secretary by Disraeli 1874; but on account of divergence from the views of the premier on the eastern question, he, like his colleague the Earl of Carnarvon, retired from the ministry early in 1878. He published a manifesto 1880, Mar. 12, announcing his adherence to the policy of the libral party as to foreign affairs, and detaching himself definitely from the conservative organization. He was sec. of state for the colonies in Gladstone's cabinet 1882, Dec.—1885, July; but 1886 joined the unionist defection. He was lord rector of Edinburgh University, 1874.

STAN'LEY, HENRY MORTON, LL.D.; D.C.L; G.C.B.; (original name JOHN ROWLANDS): explorer: b. near Denbigh, Wales, 1841, Jan. 28; d. London, 1904, May 10. He became an inmate of the poor-hourse at St. Asaph when three years old, received his first instruction there, and was appointed a teacher at Mold, Flintshire, when 13 years old. In 1857 he came to the United States a cabin-boy on a vessel bound for New Orleans; and in that city was befriended by a merchant whose name he assumed. On the death of his friend without making a promised provision for him, Stanley went to California and worked in the gold mines. In the early part of the civil war he was in the Confederate military service, but on being taken prisoner by Union troops he enlisted in the U. S. navy, where he attained the rank of ensign. After the close of the war he became a journalist; and as correspondent of the New York *Herald* wrote letters from

Crete and Asia Minor, accompanied the British expedition to Abyssinia 1867, and gained wide fame by sending a full report of Lord Napier's victory over King Theodore to London in advance of the official announcement. In 1868 he was assigned to report on the Carlist war in Spain, and in the following year received a laconic order from the late James Gordon Bennett, proprietor of the *Herald,* to 'find' Dr. David Livingston, the African missionary and explorer, from whom nothing had been heard for more than two years. Stanley stopped long enough to report the opening of the Suez canal; then hastened to Zanzibar, where he organized his expedition, with which he started for the interior of Africa 1871, Mar. 21, and succeeded in meeting Livingstone at Ujiji, Nov. 10—an achievement which an expedition equipped by English 'Livingstone Relief Committees' had failed to accomplish. On his arrival in England 1872, July, Stanley was received with general acclamation; but by his exploration of the lake region of equatorial Africa and of the Lualaba-Congo (see CONGO) 1874-77 he placed himself in the front rank of African travellers. Under a joint commission from the New York *Herald* and the London *Daily Telegraph,* Stanley started from the e. coast of Africa 1874, circumnavigated the Victoria Nyanza, marched across the country to the Albert Nyanza, and then, coming s. again, examined part of Tanganyika and its outlet toward the Lualaba. From Unyanyembe he pushed onward along the course of the Lualaba, supported by a large party of followers; and arriving at the mouth of the Congo 1877, Aug., he proved that the Congo and Lualaba were identical. In 1879 he became a leader of the Belgian International Society's expedition for establishing commercial stations on the Congo, which was highly successful. In 1887 he commanded an expedition for the relief of Emin Pacha, returning to London early in 1890. There the highest honors were paid him, including the conferring of honorary degrees by Edinburgh University, Cambridge University (both LL.D.), and Oxford (D.C.Q). He visited the United States and Australia on a lecturing tour in 1891-92; was a member of parliament for North Lambeth from 1895-1900; in 1897 visited South Africa on the invitation of Cecil Rhodes; and in 1899 was knighted G.C.B. His published works include: *How I Found Livingstone* (1872); *Coomassie and Magdala* (1874); *Through the Dark Continent* (1878); *The Congo and the Founding of the Free State* (1885); *In Darkest Africa* (1890); *Slavery in Africa* (1892); *Through South Africa* (1898).

STANNARY, a. *stăn'nă-rĭ* [mid. L. *stannārĭa,* a tin mine—from L. *stannum,* tin]: pertaining to tin mines or works (see TIN): N. a tin mine—term applied usually with reference to the peculiar laws and ancient usages connected with the tin mines in Cornwall and Devon, England. STAN'NATE, n. *-nāt,* a salt of stannic acid.

STAN'NIC, a. *-nĭk*, pertaining to or procured from tin. STANNIC ACID (see TIN). STANNIFEROUS, a. *stăn-nĭf'-ĕr-ŭs* [L. *fero*, I produce]: containing or yielding tin. STANNOUS OXIDE, compound of tin and oxygen containing half as much oxygen as stannic oxide. STANNINE, n. *stăn'nĭn*, ore of tin consisting of the sulphides of tin, copper, and iron. STANNARY COURTS, special courts in Cornwall and Devonshire for administration of justice to those connected with the tin mines.

STANNOSO-, prefix, *stăn-nō-so* [mod. L. *stannosus*, full of tin]: pertaining to tin; largely consisting of tin.

STANOVOI, *stâ-nō-voy'*, or STANOWOI KHREBET (Framework Mountains): extensive mountain chain in Siberia, in the extreme n.e. of Asia; the water-shed between the rivers which flow n. into the Arctic Ocean and those tributary to the Amur. The chain extends e.n.e., an estimated length of 3,000 m., from the Transbaikal territory along the shores of the Sea of Okhotsk; separating into several branches, one of which stretches e. to Behring Strait.

STANTON, *stăn'ton*, EDWIN MCMASTERS: 1814, Dec. 19—1869, Dec. 14; b. Steubenville, O.: war-secretary and lawyer. After two years at Kenyon College, he practiced law at Cadiz, O.; was prosecuting attorney, returned to his native place, moved to Pittsburg, and afterward to Washington, distinguishing himself in important suits before the U. S. supreme court. In 1860, Dec. 20, he was appointed attorney-general under President Buchanan —the very day that South Carolina seceded; and, amid the vacillation of the president and his advisers, stood valiantly for the Union, denouncing Secretary Floyd's proposal to give up Fort Sumter as no better than Arnold's treason. In the trying days of 1862, while the long-delayed Peninsular campaign under McClellan was in jeopardy near Richmond, President Lincoln called Stanton to the secretaryship of war, 1862, June 15, though Stanton was little known to him personally: energy was needed at the war department, and, at that time, President Lincoln doubtless regarded it as policy to select a war democrat, who, though a 'free-soiler' as far back as 1848, was disposed, like the president, to recognize the constitutional claim of slave property, as had been done in the president's offer of compensation, repeated 1862, May. The requisite energy was exhibited throughout Stanton's tenure of office, with untiring industry, ability in rapid dispatch of business, and large comprehension of affairs. While at work, Stanton was not noted for suavity, and the amount and nature of his work demanded peremptory decision. The gravest charge that can be brought against him was the publicity that he gave immediately and officially to his condemnation of General Sherman's terms of peace with General Johnston, made under a misapprehension of the wishes of the government, for which misapprehension the government

was responsible, and after the splendid service of General Sherman in bringing the war to a close. After the accession of Pres. Andrew Johnson, Stanton sided with the republicans against the president, refused to resign 1867, was restored by the senate when suspended, was again sustained by the senate 1868 against removal; but resigned after the failure of impeachment. He was appointed by President Grant justice of the U. S. supreme court 4 days before his death. He died poor, having never perverted his office to selfish gains. His service to his country in its day of storm and trial it would be scarcely possible to overestimate.

STAN'TON, ELIZABETH (CADY): reformer: b. Johnstown, N. Y., 1815, Nov. 12; d. 1902, Oct. 21; daughter of Judge Daniel Cady. She studied at the academy in her native town, became proficient in Greek, Latin, and mathematics, and graduated 1832 from Mrs. Willard's seminary in Troy. With Henry Brewster Stanton, whom she had just married, she attended the World's Anti-Slavery Convention, London, 1840. After living in Boston, she removed 1847 to Seneca Falls, N. Y.; and the following year, July 19-20, the first Woman's Rights Convention was held at her home. The inclusion of the right of suffrage for women in the demands made by this convention was due to her eloquent appeals, seconded by those of Frederick Douglass. She presented to various state legislatures and congressional committees the claims of married women to the protection of their interests, and became a popular lecturer on her favorite theme. In 1866 she was an independent candidate for congress, and two years later became one of the founders and editors of *The Revolution.* For ten years she was president of the national committee of the woman suffrage party and of other bodies. She was one of the authors of a *History of Woman's Suffrage.*

STAN'TON, HENRY BREWSTER: 1805, June 29—1887, Jan. 14; b. Griswold, Conn.: journalist and reformer. He became a journalist in Rochester, afterward took a partial course of study at Lane Theological Seminary, soon became prominent in the anti-slavery cause, and was one of the founders of the political party of abolitionists. He married Elizabeth Cady Stanton; and soon afterward went as delegate to the World's Anti-Slavery Convention, London, 1840. He studied law, and practiced some years in Boston, removed to Seneca Falls, N. Y., 1847, became state senator and aided in the formation of the republican party. Stanton wrote largely for many papers; and for nearly 20 years before his death was one of the editors of the New York *Sun.* He published *Reforms and Reformers in Great Britain and Ireland* (1849), and *Random Recollections* (1886).

STANWIX, *stăn'wĭks,* JOHN: 1690-1765: pre-revolutionary soldier: b. England. He entered the British army 1706; was captain 1739; lieutenant-colonel 1745; member

of parliament 1750; colonel of a royal American regiment 1756, commanding the southern district 1757, and made brigadier-general. Subsequently he built Fort Stanwix at the Oneida portage, repaired the fort at Pittsburg, was made major-general and lieutenant-general, and returned to England, where he was lieutenant-governor of the Isle of Wight, and member of parliament. He was lost in a wreck while crossing St. George's Channel.

STANZA, n. *stăn'ză* [It. *stanza,* a stanza, so named from having a pause in the versification at the close—from L. *stārĕ,* to stand: Sp. *estancia,* stay, a stanza]: in *poetry,* a number of lines or verses regularly connected and adjusted to each other, and usually ending in a full point or pause (see RIME): a part of a poem containing every variation of measure in the poem. STANZAIC, a. *stăn-zā'ĭk,* consisting of stanzas.

STAPEDIUS, n. *stă-pē'dĭ-ŭs* [mid. L. *stāpēs,* a stirrup]: in *anat.,* a small muscle hid within the bone of the middle ear, and inserted into the neck of the stapes posteriorly. STAPES, n. *stā'pēz,* a stirrup-like bone of the middle ear, forming the third and innermost bone of the chain of ossicles stretching across the middle ear.

STAPELIA, n. *stă-pē'lĭ-ă* [after Dr. *Stapel* of Amsterdam]: extensive genus of plants having a grotesque appearance, and singularly beautiful star-like flowers, which have usually a very fetid odor, ord. *Asclepĭadācĕæ;* Carrion-flowers (q.v.).

STAPHYLE'A—STAPHYLEA'CEÆ. See BLADDERNUT.

STAPHYLOMA, n. *stăf'ĭ-lō'mă* [Gr. *staphŭlōmă,* a small tumor in the cornea of the eye—from *staph'ŭlē,* a grape]: disease of the eye in which the cornea loses its transparency and forms a pearl-colored projection; any protrusion on the anterior surface of the eye. Staphyloma of the iris occurs when there is protrusion of the iris through a perforation of the cornea either by ulceration or by a wound. Staphyloma of the cornea occurs when that coat of the eye is more or less destroyed, and when the pressure of the fluids of the eye causes protrusion of the cicatrix on the iris in the form of an opaque white prominence.

STAPHYLORRHAPHY, n. *stăf-ĭ-lŏr'ă-fĭ* [Gr. *staph'ŭlē,* a grape; *rhaphē,* a seam—from *rhaptō,* I sew] surgical operation for uniting the edges of a divided palate.

STAPLE, n. *stā'pl* [AS. *stapul,* a prop: Dut. *stapel,* a staple, a support: Dan. *stabel,* a hinge]: hook or loop of iron; iron loop stuck into a door-post to hold the bolt of the lock.

STAPLE, n. *stā'pl* [Dut. and Sw. *stapel,* a heap, a place where goods are stored up: OF. *estaple,* a public store-house where foreign merchants lodged their goods]: formerly, a market or emporium, and in England a town

to which the chief products were brought for sale, especially for export; thence the merchandise brought to be sold: in modern usage, the principal commodity or productions of a country or district: original material; raw material; main element: the thread or pile of cotton, wool, or flax, as cotton of a long *staple:* ADJ. settled; established in commerce. STA'PLER, n. *-plĕr,* dealer in principal commodities, as a wool-*stapler.* Several articles were anciently enumerated as the staple merchandise of England; of which wool was much the most important.—The Staple towns became invested with important privileges. A tribunal of great antiquity—the Court of Staple—had cognizance of all questions arising between merchants native and foreign: it was composed of 11 members native and foreign, under the Mayor of the Staple elected yearly by all the merchants in attendance. The whole system long ago passed into disuse.

STAR, n. *stâr* [Gr. *astēr;* L. *astrum;* Goth. *stairno;* Ger. *stern;* Dut. *ster;* Cornish, *steren;* AS. *steorra;* Dan. *stjarne,* a star]: one of the many twinkling luminous bodies seen in the firmament on a clear night; any luminous body, particularly when it appears in the sky: ornamental figure rayed like a star, e.g., a badge of knighthood: person or thing unusually attractive or brilliant; specially, a distinguished and popular theatrical performer: in *printing,* etc., mark of reference, called also an *asterisk:* in the *plu.,* a configuration of the planets as supposed to affect destiny: V. to adorn or stud with stars; to bespangle; in *familiar language,* to appear as an actor in a provincial theatre among inferior players. STAR'RING, imp. STARRED, pp. *stârd:* ADJ. decorated or studded with stars; influenced by the stars with respect to fortune, as ill-*starred.* STARRY, a. *stâr'rĭ,* adorned with or resembling stars; abounding with stars. STAR'RINESS, n. *-nĕs,* the state of being starry. STAR-LIKE, resembling a star. STAR'LESS, a. *-lĕs,* without stars. STAR-ANISE (see ANISE). STAR-CHAMBER (see below). STAR-FISH, sea animal of many species, having five arms or limbs branching from a centre like a star (see below). STAR-GAZER, *humorously,* an astronomer; one who studies the stars: a fish found in the Mediterranean (see below). STAR-JELLY (see NOSTOC). STARLIGHT, a. lighted by the stars only: N. light from the stars. STARPROOF, in *OE.,* impervious to starlight. STAR-REDE, *-rēd* [AS. *ræd,* counsel]: in *OE.,* knowledge of the stars; astrology. STAR-STONE, a stone having a radiated texture; a variety of sapphire which, when cut in a certain way, reflects the light in a star-like form. STAR-SPANGLED, a. studded with stars. STARWORT, the Michaelmas daisy, *Aster Tripolĭum,* ord. *Compositæ* (see MICHAELMAS DAISIES; ASTER). STAR-PAVED, a. studded with stars. STAR-THISTLE (see CENTAURIA). FALLING or SHOOTING STAR, a luminous meteor seen shooting athwart the sky, often in great

numbers. FIXED STARS, *stars* as distinguished from the *planets*, the former so called because they constantly maintain the same, or nearly the same, relative positions in the heavens (see STARS). STAR IN THE ASCENDANT, said of a person while very fortunate and prosperous, a phrase taken from the language of astrology.

STAR, in Heraldry: frequent heraldic bearing; representing sometimes the heavenly body so called, sometimes the rowel of a spur. In the latter case, it is blazoned a *Mullet* (q.v.). Stars of more than five points should have the number of points designated, and the points may be wavy. A star, or *estoile*, with wavy points, is often designated a blazing star; and when the points are more than six in number, it is usual to represent only every second point as waved.—The star is a well-known ensign of knightly rank: a star of some specific form constitutes part of the insignia of every order of knighthood.

STAR, ORDER OF THE: formerly an order of knighthood in France, founded by John II. 1350, in imitation of the order of the Garter in England. The ceremony of installation was originally performed on the festival of the Epiphany, and the name of the order is supposed to have been allusive to the Star of the Magi.

STAR-ANISE: the fruit of a shrub or small tree from Eastern Asia (*Illicium anisatum*), of the Magnolia family. It has small, fragrant blossoms, in terminal cymes and oblong leaves, which emit, when bruised, the odor of anise. The fruit is a brown eight-pointed capsule, each ray being a follicle, opening at the top, and enclosing an oval, glossy brown seed, which yields an aromatic oil, which is carminative and stimulative.

STAR-APPLE: the fruit of *Chrysophyllum coinito*, a saponaceous tropical tree, native to the West Indies. It is about 25 ft. high, very ornamental, and has slender branches and very beautiful foliage, the leaves being clothed beneath with golden-yellow hairs. The fruits are berries, about the size and shape of an apple, and varicolored, white, green, yellow, rose-colored, or purple; it contains a pulp with a pleasant flavor, but unless perfectly ripe is astringent and leaves an intense acridity in the mouth which is difficult to remove. In the centre are eight or ten cells, each containing a shining brown seed. When cut across, while immature, these cells form a many pointed star in the centre of the fruit.

STARBOARD, n. *stâr'bōrd* [Dan. *styrbord;* Icel. *stjornbordi*, the starboard—from Icel. *stjorn*, steerage, and *bord*, a board, side of a ship: Dan. *styre*, to steer—so called from the rudder consisting of an oar on the right side of the ship where the steersman stood]: the right-hand side of a ship looking toward the head or stem—the left side was called formerly *Larboard* (q.v.), now *Port* (q.v.): ADJ. lying on the right side of a ship.

STARCH, n. *stârch* [Ger. *stärke*, strength, stiffness: Sw *starkelse*, starch: Gael. *stalcadh*, starching—from *stalc*, starch (see also STARK)]: white farinaceous substance obtained from grain, potatoes, and other vegetables, used in the form of a jelly for stiffening articles of dress, etc.: V. to stiffen with starch. STARCH'ING, imp. STARCHED, pp. *stârcht:* ADJ. stiffened with starch; precise: stiff. STARCH'ER, n. *-ĕr*, one who starches. STARCH'Y, a. *-ĭ*, of or like starch. STARCH-LIKE, a. resembling starch. STARCH'EDLY, ad. *-ĕd-lĭ*. STARCH'EDNESS, n. *-nĕs*, stiffness in manners; formality.—*Starch*, or Amylaceous Matter ($C_6H_{10}O_5$), is an organized substance of the class known as carbohydrates, which occurs in roundish or oval grains in the cellular tissue of certain parts of plants. It is very widely diffused through the vegetable kingdom, and is abundant especially in the seeds of the cereals, in the seeds of leguminous plants such as peas and beans, in the tuber of the potato, in the roots of arrowroot and tapioca, in the pith of the sago palm, etc. The grains of S. from the same kind of plant are moderately uniform in size and shape, but vary in different species of plants from $\frac{1}{260}$ to less than $\frac{1}{3000}$ of an inch in diameter; and while some are circular or oval, others are angular: moreover, among other differences, some (chiefly the larger grains) exhibit a series of concentric rings, while in others no rings are apparent; and while the grains of potato-S., if illuminated by polarized light, with a Nicol's prism placed between the object and the eye, present a well-marked black cross, in wheat-S. no such cross is perceptible.

Starch Granules in Potato.

Ordinary commercial S. occurs either as a white glistening powder, or in masses which are readily pulverized; and when pressed between the fingers it evolves a slight but peculiar sound. It is heavier than water, and is insoluble in cold water, alcohol, and ether. If, however, it be placed in water at a temperature of 150° F., its granules swell from absorption of fluid, and the mixture assumes a viscid, pasty consistence. Dilute acids rapidly induce a similar change, even without the agency of heat; and if heated with dilute sulphuric acid, the S. is converted first into dextrine, and finally into glucose or grape-sugar; and manufacturing chemists avail themselves of this property to obtain glucose on a large scale. S. dissolves in cold nitric acid; and on the addition of water to this solution, a white, tasteless, insoluble precipitate falls, known as *Xyloidin*, which explodes violently when struck by a hammer; and when heated to 350° F. bursts into flame, leaving a carbonaceous residue: the composition of xyloidin is represented by the formula $C_6H_9NO_7$.

The reactions of S. with iodine and bromine are very remarkable. Iodine communicates to it a brilliant blue color; hence S.-paste serves as a delicate test for free

iodine. This coloration appears not to depend on a chemical combination, because on application of heat the color disappears, and reappears on cooling. Bromine communicates a brilliant orange tint to S.—a reaction by which the presence of free bromine may be readily detected. When heated to a temperature of 340° to 400° F., dry S. is converted into Dextrine (q.v.), or British gum. At higher temperature, it undergoes decomposition, and yields on dry distillation the same products as sugar. When heated in steam under pressure, it also passes into dextrine, and finally into glucose. The addition of a little sulphuric acid hastens these changes.

During germination of seed, the S. in the seed undergoes a kind of fermentation, and is converted into a mixture of dextrine and glucose: this change is due to the action of a peculiar ferment. Diastase (q.v.), which exists in all germinating seeds during the process of growth. Various animal matters, e.g., saliva, pancreatic juice, the serum of the blood, bile, etc., exert on S. the same action as diastase. By treating S. with chlorine, a remarkable, colorless, oily fluid, *Chloral* (q.v.) is obtained. By prolonged exposure to the air, S. paste becomes acid, in consequence of the formation of lactic acid.

S. is obtained usually by a simply mechanical separation of it from the ingredients with which it is associated; advantage being taken of its insolubility in cold water. The details of the mode of separation vary according to the source whence it is procured. Miller's *Organic Chemistry* (pp. 100,101) gives the following method of procuring *potato-starch:* This variety is prepared on a large scale from potatoes, which contain about 20 per cent. of amylaceous matter. The cellular tissue of the tuber does not exceed 2 per cent. of the mass; while of the remainder about 76 per cent. consists of water, and the rest of small quantities of sugar, salts, and azotized matters. To exact the S., the tubers, first freed from adhering earth by thorough washing, are rasped by machinery. The pulp thus obtained is received upon a sieve, and is washed continuously by a gentle stream of water so long as the washings run through milky. This milkiness is due to the granules of S. held in suspension. The milky liquid is received into vats, in which the amylaceous matter is allowed to subside; the supernatant water is drawn off, and the deposit is repeatedly washed with fresh water until the washings are no longer colored. The S. is then suspended in a small portion of water, run through a fine sieve to keep back any portions of sand, and after having been again allowed to settle, is drained in baskets lined with ticking; the mass is then placed upon a porous floor of half-baked tiles, and dried in a current of air, at first of the natural temperature; the drying is completed by application of moderate artificial heat.—To obtain S. from wheat or rice, a more complicated process is required, as the large quantity of gluten associated with the S. in these grains must be removed either by fermentation, or by a weak alkaline solution, which dissolves the gluten, but

does not affect the S. granules. The manufacture of S. from maize (Indian corn) by an alkaline process dates from 1842, when it was introduced by Thomas Kingsford, whose S. factory in Oswego, N. Y., is now and long has been perhaps the most extensive establishment of the kind in the world. The alkaline process itself was invented by Orlando Jones, and patented 1840, for producing S. from rice. The method of treating the raw material varies in some respects according to the sort of grain employed, whether rice or maize, etc.; but the principle is essentially the same. In Jones's process for manufacturing rice S., the rice is first steeped in an alkaline solution containing about 200 grains of caustic soda or potash to the gallon: for each 2 lbs. weight of rice a gallon of solution is allowed. After 24 hours the liquid is drawn off, the rice is washed and ground fine, then steeped in alkaline solution again, with frequent stirring, for 24 hours: it is then allowed to stand for 70 hours, when the gluten is found floating at the top of the liquid. This gluten is drawn off, purified, and utilized, or it is used crude for feeding animals: the fibrous portion of the grain remains at the bottom, mingled with S. The deposit is now stirred, washed in abundance of water, and the mixture allowed to stand. The fibrous portion then settles at the bottom, while the liquid containing the S. in solution is further purified, allowed to settle, collected, dried, and then enters commerce. S. from maize is manufactured in three different qualities or forms; viz., 'corn S.' for food, 'laundry S.,' and 'manufacturer's S.' for use in cotton-print works.

The importance of S. is obvious when we consider that it may be regarded as the starting-point in the preparation of brandy and other forms of spirit, also of beer and porter; and that it enters largely into the great *saccharine* group, constituting one of the leading subdivisions of food: see DIGESTION. It is, moreover, largely used in laundry work, also in manufacture of dextrine and grape-sugar.

Physiological and Medical Relations.—It might be inferred *a priori* that S. is an essential article of diet, from its abundance in edible vegetables, even were not the fact established by numerous physiological experiments. Thus, various kinds of potatoes yield 12 to 27 per cent. of S.; peas, 32½ per cent.; beans, 34 to 36 per cent.; wheaten bread, 53½ per cent.; wheaten flour, 56½ to 72 per cent.; oatmeal, 59 per cent.; ryemeal, 61 per cent.; barley-meal, 67 per cent.; Indian corn, 81 per cent.; rice, 83 to 85 per cent.; and it occurs in even larger proportions in arrow-root, sago, and tapioca. The diet proper for a state of health consists in due admixture of the albuminous, saccharine (or starchy), oleaginous, and saline groups; but in certain forms of disease, an excess or a diminution of the starchy element is expedient. Thus, in cases of weak gastric digestion, it is not advisable to mix starchy food with the albuminous, as it soaks up the too scanty gastric juice without making any use of it. In such cases, moreover, articles of food like potatoes, new bread, pastry, etc., are apt to turn acid in the stomach, and check digestion.

There are, on the other hand, cases of gastric disorder in which a purely starchy diet is expedient. Thus, according to Dr. Chambers, it is the best form of food 'during acute catarrhal bilious attacks at the commencement of treatment, in even chronic gastric cases, and whenever a dusky complexion, hypochondriasis, or general distress show that arrested moulting has caused a collection in the body of effete tissues' (*Dietetics* in *Clinical Lectures*, 4th ed., 539). In early stages of rheumatic fever and other acute diseases, it is usually expedient to limit the diet of the patient for a day or two to a purely starchy diet, e.g., arrowroot, tapioca, panado, etc. In returning from a purely starchy to a mixed diet, Dr. Chambers suggests that such an arrangement shall be adopted as to prevent starchy and albuminous foods from being together in the stomach, e.g., let the morning and evening diet be vegetable, with a mid-day meal of purely animal food. It should be recollected that though S. is converted into sugar by the saliva, pancreatic fluid, and intestinal juice (see DIGESTION), the change takes place principally from the action of the last-named two fluids in the small intestine. Hence, when the duodenum, jejunum, or ileum are morbidly affected, as in typhoid or enteric fever, in enteritis, in diarrhea, etc., little or no S. should be given in the food.—See DIET: FOOD AND DRINK.

Wheat-starch, the only S. admitted into the Pharmacopœia, is employed in medicine in the form chiefly of mucilage (prepared by triturating 120 grains of S. with 10 fluid ounces of distilled water gradually added, and boiling for a few minutes, constantly stirring). This preparation is used either alone or as a vehicle for more active agents, as an enema, in dysentery, diarrhea, flatulent distention of the bowels, etc.; externally, it is used as an application to excoriations, to prevent bed-sores, etc., and as a basis for dusting-powders in various forms of discharging skin-diseases. For its use in surgery for construction of immovable bandages, see SPLINTS.

STAR'-CHAMBER: tribunal of considerable note in Eng. history, which met in the old Council-chamber of the palace of Westminster, and is said to have its name from the gilt stars which were the decoration of the ceiling. It is supposed to have originated in early times out of the exercise of jurisdiction by the king's council, acting as the *concilium ordinarium* and not *privatum*. The powers of the council, however, had been abridged by several acts of Edward III., and had altogether greatly declined when act 3 Henry VII. c. 1, either revived and remodelled them, or instituted, according to the view taken by Hallam, an entirely new tribunal. This statute conferred on the chancellor, the treasurer, and the keeper of the privy seal, with the assistance of a bishop and a temporal lord of the council, and chief-justices, or two other justices in their absence, a jurisdiction to punish, without a jury, the misdemeanors of sheriffs and juries, as well as riots and unlawful assemblies. Act 21 Henry VIII. c. 20 added to the other members of the court the

pres. of the council. Whether or not the above cited act of Henry VII. meant to constitute a court distinct from the council, it is certain that, by the time of Elizabeth, the two jurisdictions were merged in one; and the resulting tribunal was, during the Tudor age, of undoubted utility, in bringing to justice great and powerful offenders who would otherwise have been able to defy the law. The civil jurisdiction of the S.-C. at that period comprised controversies between English and foreign merchants, testamentary causes, disputes between the heads and commonalty of corporations lay and ecclesiastical, and claims to deodands. As a criminal court, it could inflict any punishment short of death, and had cognizance of forgery, perjury, riots, maintenance, fraud, libels, conspiracy, misconduct of judges and others connected with administration of law, and all offenses against the state, so far as they could be brought under the denomination of contempts of the king's authority. Even treason, murder, and felony could be brought under the jurisdiction of the S.-C., where the king chose to remit the capital sentence. The form of proceeding was by written information and interrogatories, except when the accused person confessed, in which case the information and proceedings were oral; and out of this exception grew one of the most flagrant abuses of this tribunal in its later history. Regardless of the existing rule, that the confession must be free and unconstrained, pressure of every kind, including torture, was used to procure acknowledgements of guilt; admissions of insignificant facts were construed into confessions; and fine, imprisonment, and mutilation inflicted on a mere oral proceeding, without hearing the accused, by a court consisting of the immediate representatives of prerogative. This court, acting without a jury, could proceed on mere rumor: moreover both its constituency and the range of its jurisdiction had become utterly indefinite and vague. The proceedings of the S.-C. had always been viewed with distrust by the commons; but during the reign of Charles I. its excesses reached a height that made it absolutely odious to the country at large; and in the last parliament of that sovereign, a bill was carried in both houses (16 Car. I. c. 10), which decreed its abolition.

STARE, v. *stär* [Icel. *stara;* Sw. *stirra;* Dan. *stirre*, to look fixedly; Norw. *star*, eyes, sight: Ger. *starr*, stiff, rigid]: to look fixedly with wide-open eyes; to gaze; to fix an earnest look on an object: N. a fixed look with eyes wide open. STAR'ING, imp.: ADJ. gazing with a stare; sticking out. STARED, pp. *stärd*. STAR'ER, n. *-ėr*, one who stares. STAR'INGLY, ad. *-ĭng-lĭ*. TO STARE IN THE FACE, to be plainly before the eyes.

STAR'-FISH (*Asteriadæ*): family of *Echinodermata* (q.v.), having in the centre of the body a stomach with only one aperture, but extending by two much-branched cæca, into each of the rays into which the body is divided. In some, the central disk extends to include the rays, so that the general form is angular or lobed; in others, the disk is very small in comparison with the length of the

rays. Locomotion is effected by very numerous Ambulacra (q.v.) in rows on the under side of the rays. A bony framework, of a vast number of pieces, extends to the extremity of each ray. The nervous system has its centre around the mouth and sends a filament to each ray. Star-fishes are hermaphrodite, and produce vast numbers of eggs, which are retained for a time under the body of the parent, resting on the points of its rays at the bottom of the sea, and raising up the centre of the body, in order as it were to hatch them. The young are destitute of rays, and very unlike the mature form, so that their real nature was long mistaken. The mouth of star-fishes being on the under side, they seek their food—as indeed they perform all their motions—by crawling at the bottom of the sea, or on rocks, etc. They are very voracious, and are trouble-

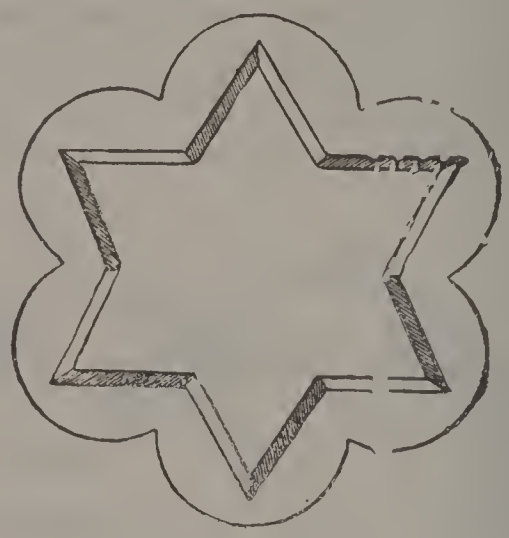
Star-fishes.

1, Common Cross-fish (*Uraster rubens*); 2, Gibbous Starlet (*Asterina gibbosa*); 3, Common Cross-fish, reproducing rays; 4, Eyed Cribella (*Cribella oculata*); 5, Lesser Sand-star (*Ophiura albida*). —From Forbes's *British Star-fishes*.

some to fishermen by devouring their bait. They possess, in very high degree, the power of reproducing lost members; a disk with a single ray left will reproduce the other rays, and become a perfect star-fish. More extraordinary is the readiness which many of them display, particularly those with long and slender rays, in breaking off these members. Some species—BRITTLE STARS—can scarcely be procured for a museum in an approximately perfect state, because they throw off ray after ray, and, in fact, break themselves to pieces on any alarm. Star-fishes abound in the seas of all parts of the world. The COMMON S., CROSS-FISH, or FIVE FINGERS (*Asterias* or *Uraster rubens*) is plentifully cast up on the beach by the tide, or thrown out of fishing-boats in harbors. Some of the species

are much larger; and some exhibit very beautiful colors, while others are interesting from their structure—the long serpent-like form of their rays, or the division of the rays by successive forkings, so that the whole creature is a globular mass, whose surface is formed of a countless multitude of living tendrils.

STAR'-FORT, in Field Fortification: strong work consisting of alternate salient and re-entering angles, arranged on a regular or irregular polygon. It is a common defense



Star-fort.

for an eminence on a battle-field, or at the wing of a line, or as protection for reserve-stores of an army

STARGARD, *stâr'gârt* (Slav. *Starograd* or *Starigrod*, i.e., Old Town): town of Germany, province of Pomerania, on the navigable river Ihna, 23 m. e.s.e. of Stettin, with which, as with Posen and the whole of e. Prussia, it is connected by railway. S. was formerly cap. of Lower Pomerania. It has various but not very important manufactures. S. was raised to the rank of a town 1129. Pop. 21,816.

STAR-GAZER, *stâr'gâz-ĕr:* percoid fish of genus *Uranoscopus* [Gr. *ouranos*, heaven; *skopeō*, I explore]. Both eyes are on the upper side of the head, which is of nearly cubical form; the mouth, cleft vertically, is also directed upward. All this agrees with the habits of the fish, which buries itself in a muddy bottom, protruding its head, and thus awaiting prey. The eyes, moreover, are singularly protrusive and retractile. Some of the fish have a worm-like appendage of the mouth, to angle for prey. The species are mostly E. Indian. *U. scaber* of the Mediterranean is 1 ft. long. *U. anoplos* of S. C. is 2 in. only, and, as the name indicates, is unarmed with the spines which render some species dangerous to handle.

STARK, a. *stârk* [Icel. *sterkr;* Dan. *stærk;* Sw. and Ger. *stark*, rigid, stiff: Icel. *storkna*, to congeal, to stiffen (see STARCH)]: stiff; strong; gross; mere; downright; stiff in death: AD. wholly; entirely. STARK'LY, ad. *-lĭ*, in *OE.*, in a stark manner; stiffly; strongly.

STARK, JOHN: 1728, Aug. 28—1822, May 8; b. Londonderry, N. H.: revolutionary hero. His father emigrated from Ireland to the wilds of Dunbarton, near the present Manchester, N. H., and young S. grew up an expert hunter. Captured by Indians, he surprised them by returning blows when running the gantlet, and was honored by them with adoption. He distinguished himself as capt. of rangers in the French war, at Lake George, and was in service till the end of the war. At the opening of the revolution, he hastened to Cambridge with recruits, was made col., and raised a regt. of frontiersmen from the many who followed him, and repeatedly drove back the enemy in his front at Bunker Hill. After the evacuation of Boston, he was in the Canada expedition, and, later, led in the attack at Trenton; also had part in the battle of Princeton. Regarding himself as slighted in promotions, he retired to his farm, but was called by his state to the command of its troops. Acting thus independently, he disobeyed Gen. Lincoln's orders, and consulting his own better judgment, defeated Col. Baum and his force of 1,000 at the famous battle of Bennington, killing 200 and capturing 600 men. This was the first step to Burgoyne's disasters; and congress, which had just censured S.'s disobedience, now made him brig.gen. Recruiting new volunteers, he contributed largely to the surrender of Burgoyne by preventing his retreat. He commanded the n. dept. 1778; was on duty in R. I. and N. J. 1779-80; was on the André court-martial; and again was appointed to the n. dept. After the war he led a retired life. Some of his sayings, such as a direction how to fire at Bunker Hill, and that the enemy must be beaten at Bennington or Molly Stark would be a widow, became familiar proverbs. An obelisk perpetuates his memory at Manchester, N. H.; and one 301 ft. high, dedicated 1891, commemorates the Battle of Bennington (q.v.).

STARLING, n. *stâr'ling* [perhaps Ger. *starr*, stiff; *starren*, to stiffen]: one of the large piles driven down outside the foundation of a pier of a bridge to break the force of the water.

STARLING, n. *stâr'ling*, also called STARE, *stär* [AS. *stær;* Icel. *starri;* Ger. *staar;* L. *sturnus*, a starling], (*Sturnus*): Linnæan genus of birds, of order *Insessores;* now the family *Sturnidæ;* nearly allied to *Corvidæ*, but in general of smaller size; bill more slender and compressed, with point nail-like; wings long and pointed. They are natives of almost all parts of the world, very generally gregarious, and some of them migratory. They feed on worms, insects, larvæ, and fruits. Some follow herds of quadrupeds, to feed on the insects which attend them. The COMMON S. (*Sturnus vulgaris*) is a beautiful bird, rather smaller than the song-thrush or mavis; brown, finely glossed with black, with pale tip to each feather, giving the bird a fine speckled appearance, particularly on the breast and shoulders; in advanced age it is more uniform in color. The plumage of the female is less beautiful than that of the male. Both sexes are more speckled in winter

than in summer. The S. is abundant in Britain, and nowhere more so than in the Hebrides and Orkneys; it is very plentiful in the fenny districts. It is found in all parts of Europe, and throughout great part of Africa; and is common in n. Asia. Starlings make artless nests of slender twigs, roots, and dry grass, in hollow trees, in holes of cliffs, under eaves of houses, or in boxes, often placed for them in trees or elsewhere near houses. They frequently breed twice in a season, and in autumn they unite in large flocks. The S. becomes very pert and familiar in confinement, displays great imitative powers, and learns to whistle tunes, and even to articulate words with great distinctness. Its natural song is soft and sweet. See GRAKLE.—For the AMERICAN STARLINGS, formerly included under the genus *Sturnus*, a separate family, *Icteridæ*, has been made, representing the *Sturnidæ* of the old world, and intermediate between finches and crows. It comprises the bobolink, orioles, and blackbirds. The name American S. is sometimes applied especially to our Meadow or Field Lark (*Sturnella magna*), the underparts conspicuously bright yellow, with a large black crescent separating the throat from the lower breast. Its few notes are very sweet. In the south it is much used for food, like other birds that abound there in winter, though this species is imperfectly migratory. It abounds in all the e. states, replaced in the w. by a variety, *Neglecta*, of paler color, with distinct bars on the wing and tail feathers. In S. America there is a similar species, with red instead of the yellow.—The name S. is curiously applied to a rock-trout (*Hexagrammus Stelleri*) in the Straits of Fuca.

STAR-NOSE, *stâr' nōz* (*Condylura*, or *Astromyctes*, genus of the Mole (q.v.) family, *Talpidæ*, having much general resemblance to moles, but with longer tail, and elongated slender muzzle, which bears at its extremity a remarkable structure of fleshy and somewhat cartilaginous rays disposed in star-like form. The habits are similar to those of moles. All the species are natives of N. America. The best known is *Condylura cristata*, which inhabits the eastern United States and Canada.

STARODOUB, *stâ-rō-dôb'*: town of European Russia, govt. of Tchernigov; 100 m. n.e. of the town of Tchernigov. It is in a fertile district, but distant from any commercial route. Pop. (1880) 16,820.

STAR OF BETH'LEHEM (*Ornithogalum*): genus of bulbous-rooted plants of nat. order *Liliaceæ*, nearly allied to Squills and Hyacinths. The species are numerous, natives almost exclusively of the e. hemisphere, many of them of the Cape of Good Hope, and some of s. Europe. The Common Star of Bethlehem (*O. umbellatum*), native of France, Switzerland, Germany, the Levant, etc., is very common in flower-gardens. Its flowers are large, six to nine, in a corymbose raceme, white and somewhat fragrant. *Gagea lutea*, formerly *O. luteum*, has yellow flowers

STAR OF IN'DIA, THE MOST EXALTED THE ORDER OF THE: order of knighthood instituted by Queen Victoria 1861, June, with the view of commemorating the formal assumption by the British sovereign of the direct government of India; and of affording the princes, chiefs, and people of the Indian empire a testimony of regard in the bestowment of the decoration in honor of merit and loyalty. The order consists of the sovereign, a grand-master, who is to be the governor-general of India for the time being, and 25 knights, with such extra and honorary knights as the crown may appoint. The members are to be military, naval, and civil officers who have rendered important service to the Indian empire, and such native chiefs and princes of India as have entitled themselves to the sovereign's favor. The insignia consist of a collar, badge, and star—with the motto 'Heaven's light our guide.'

STARS: luminous bodies in the heavens, distinguished from planets by remaining apparently immovable with respect to one another, hence early called fixed stars—which name they retain, though their perfect fixity has been completely disproved in numerous cases, and is no longer believed in regard to any. Twinkling, or Scintillation is another mark which distinguishes stars from planets.

Among the facts first noticed by the observer of the stars is their apparent daily motion. Most of them appear to rise in the e., describe smaller or greater arcs in the heavens, and set in the w.; while others describe complete circles round a point n. of the zenith, that described by the so-called polar star being the smallest visible to the naked eye (see CIRCUMPOLAR STARS). These apparent motions are due to the rotation of the earth on its axis. Had the earth only this rotary motion, the aspect of the starry heavens at any spot on the earth's surface would be the same at the same hour of the night all the year round; which is not the fact. In consequence of the earth's motion round the sun, or the apparent advance of the sun among the stars, the aspect of the heavens at a particular hour is always changing.

With few exceptions, the *distance* of the fixed stars is still unknown, and must in all cases be enormously great. Since the time of Bradley, many attempts have been made to measure what is called the *yearly parallax* of the stars, and thus determine their distances (see PARALLAX). When we consider that the motion of the earth round the sun brings us at one time a whole diameter of its orbit (nearly 186 millions of miles) nearer to a particular region of the heavens than we were six months before, we should expect a change in the relative distances of the stars as seen from the two points—that as we approach them they should seem to separate. But no change is seen; and this was one of the objections advanced by the early writers of the theory of Coper-

nicus. The only answer that the Copernicans could give was, that the distance of the stars from us is so great that the diameter of the earth's orbit is as a point compared with it. The detection of the parallax of the fixed stars depended on the perfection of instruments. The parallax of a star is the minute angle contained by two lines drawn from it, one to the sun, the other to the earth. If that angle amounted to a second, the distance of the star would be 206,000 times that of the sun; and when the measurement of angles came to be trustworthy to a second, and still no parallax was discernible, astronomers could say that the distance of the nearest stars must be more than 206,000 times that of the sun—i.e., 206,000 times 92 millions of miles, or about 20 billions of miles. It is only since between 1832 and 38 that any approach to positive determinations of parallax has been made, chiefly by Henderson, Bessel, and Peters. The first published (1838, Dec.) was that of the double star 61 in the constellation of the Swan, by Bessel, who made the parallax 0″·37, giving a distance more than 550,000 times that of the sun, or 52 billions of miles, so that the light of this star is about 8⅔ years in reaching the earth. The nearest of all the stars yet measured is *α Centauri*, the finest double star in the southern heavens, whose parallax was determined by Henderson and Maclear at the Cape of Good Hope to be 0″·9128 (the observations were made in 1832–3; the result read before the Astronomical Soc. of England, 1839, Jan.); or as subsequently corrected, 0″·9187, corresponding to a distance of about 20 billions of miles, and requiring 3¼ years for its light to reach us. To Sirius, the brightest of the stars, a parallax of 0″·15 has been assigned, implying a distance six times that of *α* Centauri. 'It has been considered probable, from recondite investigations, that the average distance of a star of the *first* magnitude from the earth is 986,000 radii of our annual orbit, a distance which light would require 15½ years to traverse; and further, that the average distance of a star of the *sixth* magnitude (the smallest distinctly seen without a telescope) is 7,600,000 times the same unit—to traverse which, light, with its prodigious velocity, would occupy more than 120 years. If, then, the distances of the majority of stars visible to the naked eye are so enormously great, how are we to estimate our distance from those minute points of light discernible only in powerful telescopes? The conclusion is forced upon us that we do not see them as they appeared within a few years, or even during the lifetime of man, but with the rays which proceeded from them several thousands of years ago!'—Hind's *Astronomy* (see LIGHT-YEAR.)

The stars have from the earliest times been divided into groups called Constellations (q.v.). The several stars belonging to the same constellation are distinguished from one another by Greek letters, beginning the alphabet with the brightest; and when these are not sufficient, by Roman letters and by numbers. Many of the most brilliant stars have special names. They are divided also according to their brightness into stars of the first, second, third, etc.,

magnitudes—a division necessarily somewhat arbitrary. The smallest stars discernible by a naked eye of ordinary power are usually called stars of the fifth magnitude; but an unusually sharp eye can discern those of the sixth and even seventh magnitude. All smaller are *telescopic* stars, which are divided in a very undetermined way as far as to the twentieth magnitude. Sir J. Herschel has determined that the light of Sirius, the brightest of all the stars, is 324 times that of a mean star of the sixth magnitude. By processes of photometric observation and reasoning, it is concluded that the intrinsic splendor of α Centauri is more than twice that of our sun, and that of Sirius 394 times. Among stars of the first magnitude in the n. hemisphere are usually reckoned Aldebaran (in Taurus), Arcturus (in Bootes), Altair (in Aquila), Betelgeux (in Orion), Capella (in Auriga), Procyon (in Canis Minor), Regulus (in Leo), Vega (in Lyra). In the s. hemisphere are Achernes (in Eridanus), Antares (in Scorpio), Canopus (in Argo), Rigel (in Orion), Sirius (in Canis Major), Spica (in Virgo), and α Centauri and α Crucis that have no special names.

No apparent magnitude, in the proper sense of the word, has yet been observed in any star. In the best and most powerfully magnifying telescopes, even the brightest stars of the first magnitude appear, not with small disks as all the planets do, but as luminous points without any visible diameter, and always the smaller the better the telescope. We are therefore totally ignorant of the real size of the fixed stars; nor could it be determined though we were sure of their distances, for the apparent diameter is an essential element in the calculation. We cannot, then, say whether the greater brilliancy of one star, when compared with another, arises from its greater nearness, its greater size, or the greater intensity of its light. It is certain that all the fixed stars are self-luminous. By the spectroscope several facts regarding their physical constitution have been revealed; there are great differences in their spectra; the existence of several known elements is considered demonstrated. Aldebaran, e.g., contains hydrogen, sodium, magnesium, iron, tellurium, antimony, calcium, bismuth, and mercury: similar results have been obtained by spectroscopic examination of Sirius, the stars of Ursa Major, and many others.

The *number* of the stars is beyond determination. Those visible by the naked eye amount only to a few thousands. Stars of the first magnitude are usually reckoned at 15–20, of the second 50–60, of the third about 200, of the fourth 400–500, of the fifth 1100–1200. But in the subsequent classes, the numbers increase rapidly, so that stars of the sixth and seventh class amount to more than 12,000. Stars are most dense in that region of the heavens called the Milky Way, which is mostly composed of stars of the eleventh and twelfth magnitudes. W. Herschel observed 116,000 stars pass the field of his telescope in a quarter of an hour, while directed to the densest part of the Milky Way.

That the fixed stars are not really immovable, as their

name would imply, is seen in the phenomenon of *Double* or *Multiple Stars*, systems of two or more stars that revolve about one another, or rather about their common centre of gravity. As they can be seen separate only by means of a telescope, and in most cases require a very powerful one, their discovery was possible only after the telescope was invented. Galileo discovered their existence, and proposed to use them in determining the yearly parallax of the fixed stars. A long time afterward, Bradley, Maskelyne, and Mayer directed attention to the phenomena of double stars; but nothing important was discovered respecting them till the elder Herschel made them the subject of a protracted series of observations, which led to remarkable conclusions as to their nature. The united observations of Struve, Savary, Encke, South, and especially of Herschel the younger, continued for four years in the s. hemisphere at the Cape of Good Hope, have raised the number of observed double, or rather multiple, stars to more than 6,000, of which the greater part are binary, or composed of two, but many are triple, some quadruple, and a few even quintuple, or consisting of five stars. The distance between the stars composing these systems is always apparently small (varying from less than 1″ to 32″); but apparent nearness does not always constitute a double star, for two really distant stars are frequently so nearly in the same line, as seen from the earth, that they appear close together. In real multiple stars, the individuals are not only comparatively near one another, but they revolve around one another. Among stars of the first three magnitudes, every sixth is a multiple star; among the smaller stars the proportion is much less. In some cases, one of the stars is much larger than the other, as in the star Rigel in Orion, and in the polar star; but oftener the connected stars are nearly equal in luminous power. The two members of double stars are mostly of one color, but a difference of color is observed in about one-fifth of the whole number. In many of these cases, one color is the complement of the other.

In 1803, after 20 years' observation, Sir W. Herschel advanced the view, which has been more and more confirmed since, that double stars are connected systems of two or more stellar bodies, revolving in regular orbits around one another, or rather round their common centre of gravity. Their motions are found to follow the same laws as prevail in the solar system, and the orbits are elliptical. These distant bodies are therefore subject to the Newtonian law of gravitation. The period of revolution has, in several cases, been roughly approximated. The most remarkable instance of a regular revolution is that of the double star ξ Ursæ Majoris, in which the two stars complete a revolution about one another in 60 years. In the double star 70 Ophiuchi the period of revolution is about 80 years. In cases where the parallax is known, the size of the orbits can be determined; thus the astronomer is able to assert in regard to the double star 61 Cygni that the orbit described by these two stars about each other

undoubtedly greatly exceeds in dimensions that described by Neptune about the sun. Even the masses of these two stars have been calculated as being together 0·353, that of our sun being 1. It is a consequence of these revolutions that many stars are now seen double that formerly seemed single, and *vice versa*. If the plane of revolution have its edge presented to the earth, the stars will seem to move in a straight line, and at times to cover one another. The star ζ Herculis, seen by Herschel double 1781, appeared single 1802, and was seen double again first by Struve 1826. The figure represents the relative positions of the

Fig. 1.

two stars composing γ in Virgo, at different times since the earliest observations. The period of revolution is presumed to be 182 years.

The *proper motion* of stars, discovered by Halley, is of another kind It consists in a displacement in various directions of the individual stars, so that the configuration of constellations is slowly changing. 'The Southern Cross,' says Humboldt, 'will not always shine in the heavens exactly in its present form; for the four stars of which it consists move with unequal velocity in different paths. How many thousand years will elapse before its total dissolution cannot be calculated.' The proper motions yet observed vary from $\frac{1}{20}$ of a second to 7″·7. According to Bessel, the proper motion of the binary star 61 Cygni amounts to 5″·123, so that in 360 years it would pass over a space equal to the moon's diameter. It must thus take thousands of years to alter sensibly the aspect of the heavens; though, taking into account the enormous distances, the actual velocities must be great. Of 3,000 stars observed by Bessel, 425 had perceptible motion. Argelander has recently published a list of 560 stars having a proper motion.

It was observed first by Sir W. Herschel that there is a perceptible tendency in the stars generally to diverge or open in one quarter of the heavens, and to draw together

in the opposite quarter; and this he attributed to a proper motion of our sun with his planets in the direction of the former point. The apparent motion thus caused is complicated with the real independent motions of individual stars. The point toward which this motion is directed, which is called the 'solar apex,' was fixed by Herschel in the constellation Hercules; and the result of subsequent and independent researches gives a nearly coincident point. The velocity has been calculated at more than 150 millions of miles a year, or 17,600 miles an hour—i.e., rather more than one-fourth of the earth's velocity in its orbit.

The spectroscope has been applied to investigate the physical constitution of the stars, with the result of identifying many of the elements composing our sun and earth. The spectra of the stars differ greatly among one another; some consisting mainly of simple lines, others having complex bands (see SPECTRUM). The simple spectra are believed to indicate great intensity of heat, keeping the molecules of matter in a state of extreme dissociation; while the complex spectra show the molecules more associated in groups or compounds, owing to the repulsive force being less. The bluish stars are the hottest; a red tinge indicates comparative coolness. Our sun seems to be a star which is growing cooler.

Several stars exhibit well-marked periodic alterations of a striking nature, and hence are called *variable stars.* A considerable number have been observed, of which the most remarkable are Mira (the 'wonderful') in Cetus, and Algol in Perseus. Mira attains its greatest lustre every 334 days, and appears for 14 days as a star of the

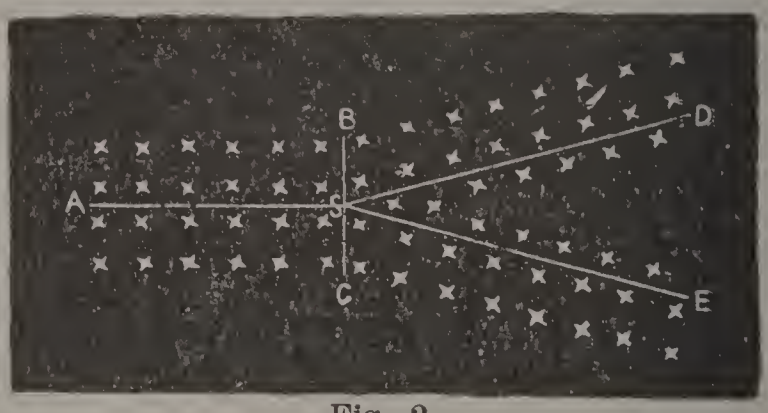


Fig. 2.

second and even at times of the first magnitude; it then decreases for two or three months, till it becomes of the sixth and even tenth magnitude, so as to be for half a year invisible to the naked eye and usually to telescopes. After this it begins again to increase, but more rapidly than it decreased. It is visible to the naked eye for three or four months of its period. Of all the variable stars yet observed in Perseus, Algol has the shortest period, being 68 hours 49 minutes. It appears for about 60 hours, as a star of the second magnitude, then decreases for four hours and appears for a quarter of an

hour of the fourth magnitude, after which it increases again for four hours. Various explanations have been offered of these mysterious appearances: no one explanation applies to them all. Where the periods are long, we may suppose that the stars affected have periodic maxima and minima of activity or disturbance analogous to those of our solar system, as exhibited by sun-spots. When the period is short (e.g., in the case of Algol), we may suppose that a large opaque orb circling round the star makes a transit at regular intervals.

Allied to the variable stars are the *new* or temporary stars that appear suddenly in great splendor, and then disappear without leaving a trace. A number of instances are on record. It is not impossible that these also may be periodic.

Star Systems.—From the appearances connected with the Milky Way or Galaxy (q.v.), Sir W. Herschel came to the conclusion that the stars forming our firmament do not extend indefinitely into space, but are limited in all directions, the mass having a definite shape. He conceived the shape to be something like that of a huge millstone, having one side cleft, and the two laminæ set apart at a small angle. Let the diagram (fig. 2) represent a vertical section of such a broad flat stratum, and suppose the solar system situated as at S: to a spectator looking on either side, in the direction of the thickness, as SB, the stars would appear comparatively sparse, but all round in the direction of the breadth (as SA) there would appear a dense ring, which would separate into two branches (SE, SD) in the direction of the cleft side. This supposition accounts for the appearance of the Milky Way, and all subsequent observations have tended to confirm the conjecture. Situated as we are within the system, we cannot hope ever to attain more than a rude notion regarding it; to get a definite outline, we must be placed without it.

But this star system which we may call our own, as our sun belongs to it, is but an item in the stellar universe.

STARS AND BARS, The: a name applied to the flag of the Confederate States of America. It was an adaptation of the stars and stripes. In 1861, March 5, the Flag Committee appointed in the Provisional Senate of the Southern States recommended that 'the flag of the Confederate States shall consist of a red field with a white space extending horizontally through the centre, and equal in width to one-third the width of the flag.' It was first displayed 1861, March 4, simultaneously with the inauguration of Lincoln, being unfurled over the State House at Montgomery, Ala. In 1863 the Confederate Senate adopted a white flag with one blue star in the centre, the Stars and Bars bearing too close a resemblance to the Stars and Stripes.

START, n. *stârt* [Ger. *sturz*, a fall, that which projects abruptly; *stürzen*, to hurl, precipitate: Dan. *styrte*, to fall, precipitate: Dut. *storten*, to hurl or throw head-

long]: a sudden and momentary twitching motion of the body; a sudden motion of the body caused by fear; a sudden rousing to action; a quick spring; first motion from a place; act of setting out; advantage in the outset: V. to do with a sudden spring; to disturb suddenly, as by fear or ill news; to bring or put into motion; to move suddenly; to shift from its place; to dislocate; to set out; to commence; to bring into view or notice; to shrink; to wince. START'ING, imp.: N. act of one who starts. START'ED, pp. START'ER, n. *-ėr*, one who starts. START'LINGLY, ad. *-lĭ*, with sudden fits; with frequent intermission. To START AFTER, to set out after; to follow. To START AGAINST, to act as a rival candidate against. To START FOR, to set out on a journey; to be a candidate for, as an office. To START UP, to rise suddenly; to bring into motion. To GET THE START, to begin before another. To GIVE A START, to occasion sudden fear. To START A CASK, to open it. AN UPSTART, one who has suddenly come into notice from an inferior state. STARTUP, n. in *OE.*, same as UPSTART; a high shoe: ADJ. suddenly come into notice. STARTING-HOLE, in *OE.*, evasion; loop-hole. STARTING-POINT, the point from which motion begins, or from which a thing moves. STARTING-POST, the point from which race-horses begin to run in a race. STARTING-VALVE, the valve through which the steam from the boiler, or from the connecting pipes, is admitted to the cylinder of an engine. It may be any one of the following types: A sliding disc valve actuated by a lever; a lift or poppet globe valve lifted by a screw; or a plug valve turned by a wheel. FITS AND STARTS. See under FIT 1.

START, n. *stârt* [Dut. *stert;* Ger. *sterz;* Icel. *stertr*, a tail]: in *OE.*, a tail, as in *redstart*, the bird with the red tail; also, a handle; a plow-tail.

STAR-THISTLE: one of the European plants of the genus *Centaurea* (q.v.). They are not true thistles, but are closely allied composites. *C. calcitrapa*, is an annual, much branched and spreading weed sparingly naturalized in America. It has 1 to 2 pinnatifid, serrulate, spiny leaves, the upper one sessile and clasping. The flower-heads are purple, small and rayless, and have an ovoid receptacle surrounded by ovate, involucral bracts, the outer being long and spreading, and tipped with stout spines.

STARTLE, v. *stârt'l* [from START 1, which see]: to excite with sudden fear or apprehension; to excite by extreme surprise; to shock; to move suddenly in alarm. START'LING, imp. *-lĭng:* ADJ. suddenly impressing with fear; dreadfully surprising. START'LED, pp. *-ld:* ADJ. caused to start; surprised. START'LINGLY, ad. *-lĭ.*—SYN. of 'startle': to shock; fright; frighten; surprise; alarm.

START POINT [AS. *steort*, a tail or promontory]: rocky headland in s. Devonshire, with a light-house 204 ft. above the sea, lat. 50° 13′ 4″ n., and long. 3° 38′ w.

STARVATION, or INANI'TION: terms applied to the phenomena resulting from entire deficiency, or insufficient supply of food. From Chossat's well-known experimental investigations of this subject (*Recherches Experimentales sur l'Inanition*, Paris 1843), it appears that the average loss of weight in mammals and birds, between the commencement of fasting and the death of the animal, was 40 per cent, the loss varying above and below 40 per cent, in the different organs and tissues, as shown in the table:

PARTS WHICH LOSE MORE THAN FORTY PER CENT.		PARTS WHICH LOSE LESS THAN FORTY PER CENT.	
Fat	93.3	Muscular Coat of Stomach	39.7
Blood	75.0	Pharynx and Œsophagus	34.2
Spleen	71.4	Skin	33.3
Pancreas	64.1	Kidneys	31.9
Liver	52.0	Lungs	22.2
Head	44.8	Bones	16.7
Intestines	42.4	Eyes	10.0
Muscles of Locomotion	42.3	Nervous System	1.9

Hence it appears that there is almost complete removal of the fat, and great reduction of the blood, while the nervous system is scarcely affected; and hence it seems as if the supervention of death was coincident with the consumption of all the combustible materials of the body, and that previously the remaining nutritive force was concentrated on the nervous system.

The following are among the most prominent phenomena which Chossat observed either during the experiments or after the death of the animals: 1. Dropsical effusions. 2. Softening and destruction of the mucous membrane. 3. Blackening of the viscera, especially of the liver. 4. Bluish, livid, yellow, and reddish stains during life in the transparent parts of the skin. 5. Hectic fever, and a continuous decrease in the power of the body to resist cold. 6. At first a scanty excretion of dry, bilious, grass-green feces, and afterward diarrhea of liquid saline matter. 7. Convulsions similar to those in death by hemorrhage. 8. Death by starvation seems to be in reality death by cold; since the temperature of the body is not much diminished until the fat is nearly consumed, when it rapidly falls, unless it be kept up by heat applied externally. 9. Young animals succumbed far sooner than adults. 10. The results of insufficient food were in the end the same as those of total deprivation; the total amount of loss being almost the same, but the rate being less, so that a longer time was required to produce it.

Chossat did not find that much influence was exerted on the duration of life by permitting or withdrawing the supply of water; but there is no doubt that in man, and probably in mammals generally, death supervenes much earlier when liquids as well as solid food are withheld. The most striking symptoms of starvation, as noted by Donovan in his report of the Irish Famine of 1847, pub-

lished in the *Dublin Medical Press* of February 1848: In the first place, pain is felt in the stomach, which is relieved on pressure. The countenance becomes pale and cadaverous; the eyes are wild and glistening; the breath hot, the mouth parched, and the saliva thick and scanty. An intolerable thirst supervenes, which, if there be no access to water, becomes the most distressing symptom. The body becomes gradually emaciated, and begins to exhale a peculiar fetor, while the skin becomes covered with a brownish dirty-looking and offensive secretion almost as indelible as varnish, which Donovan at first mistook for encrusted filth. The bodily strength rapidly declines; the sufferer totters in walking, like a drunken man; his voice becomes weak and whining, and he is ready to burst into tears on the slightest occasion. In the cases recorded by Donovan, imbecility, and sometimes almost complete iodicy, ensued; but in no instance was there delirium or mania, which has been described as a symptom of starvation in cases of shipwreck. On examination after death, the condition of the body is such as might be expected from Chossat's experiments, viz., extreme general emaciation; loss of size and weight of the principal viscera; almost complete bloodlessness, except in the brain; and the gall-bladder distended with bile, which tinges the neighboring parts. Moreover, decomposition rapidly ensues.

It is impossible to fix the exact time during which life can be supported under entire abstinence from food or drink. Dr. Sloan has given an account of a healthy man, aged 65, who was found alive after having been shut up in a coal mine for 23 days, during the first 10 of which he was able to procure a small quantity of foul water. He was in a state of extreme exhaustion, and notwithstanding he was carefully nursed, he died three days after his rescue. Dr. Willan records the case of a young gentleman who, under religious delusion, starved himself to death. He survived 60 days, during which time he took nothing but a little orange juice: in this case, life was probably abnormally prolonged by the peculiar emotional excitement of the patient. In 1880 Dr. H. P. Tanner fasted from all food (using water freely) for 40 days in New York. In the same city Giovanni Succi (1890) fasted 45 days, drinking water *ad libitum*, and taking occasionally a few drops of an 'elixir.'

It is worthy of notice that a deficient supply of food seems to check the elimination and removal of the effete materials of the body. This fact accounts not only for the tendency to putrescence exhibited during the process of starvation, and for the rapidity with which putrefaction ensues after death, but for the pestilential diseases which almost always follow a severe famine; the excess of disintegrated matter in the blood rendering the system especially prone to the reception and multiplication of the germs of the diseases characterized as zymotic, such as typhus fever, relapsing fever, etc.

STARVE, v. *stârv* [Icel. *starf*, labor, trouble: Norw. *starva*, to go slow and tottering, as a sick or wearied beast: Dut. *sterven;* Ger. *sterben*, to die]: to kill with hunger; to subdue by famine, as a besieged fortress; to perish or die with cold or hunger; to suffer extreme hunger; to be very indigent; to deprive of force or vigor; to kill with cold. STARV'ING, imp. STARVED, pp. *stârvd*. STARVATION, n. *stâr-vā'shŭn*, extreme hunger or want; state of being starved (see below). STARVELING, a. *stârv'lĭng*, hungry; pining with want: N. an animal or plant made thin or weak from want of nutriment.

STASIMORPHY, n. *stăs'ĭ-mŏr'fĭ* [Gr. *stasis*, a standing; *morphē*, form, shape]: in *bot.*, a deviation in form, arising from an arrest of growth.

STASIS, n. *stăs'ĭs* [Gr. *stasis*, a stationary posture]: in *med.*, a stagnation of the blood.

STATANT, *stā'tant*, in Heraldry: term applied to an animal standing still, with all the feet touching the ground. If the face be turned to the spectator, it is said to be *statant gardant*, or in the case of a stag, *at gaze*.

STATE, n. *stāt* [OE. *estat;* It. *stato*, state, condition—from L. *status*, condition—from *stārĕ*, to stand]: circumstances in which a person or thing is placed at any particular time; position; rank; condition: solemn pomp; appearance of greatness; dignity: the whole body of people included under one government; commonwealth; the community; the body politic; the constituents thereof; polity (for state in the American Union, see STATE, IN THE UNITED STATES OF AMERICA): one of the orders or classes of men recognized in a country, as the nobles, the clergy (see STATES, or ESTATES): civil power, as distinguished from ecclesiastical: in *OE.*, seat of dignity; an emblazoned canopy over it: V. to express the particulars of; to set down fully; to repeat with all the attending circumstances; to set forth: ADJ. of or belonging to the state; public. STA'TING, imp. STA'TED, pp.: ADJ. settled; established; occurring regularly. STA'TER, n. *-tĕr*, one who states. STA'TEDLY, ad. *-tĕd-lĭ*, at stated or appointed times. STATEMENT, n. *stāt'mĕnt*, act of representing facts or particulars verbally or in writing; the recital of the circumstances attendant on a transaction: in *Scotch law*, prisoner's declaration before the sheriff, when under criminal charge. STATE'LY, a. *-lĭ*, lofty; dignified; grand; elevated in sentiment; majestic; august: AD. in a stately manner; majestically. STATE'LINESS, n. *-nĕs*, majestic appearance; grandeur in mien or manner; affected dignity. STATECRAFT, sometimes *in contempt*, skill in state management. STATESMAN, n. *stāts'măn*, one versed in public affairs and the arts of government; one employed in public affairs; a politician: in *provincial usage*, one who occupies his own estate; a small landholder. STATES'MANLIKE, a. having the qualities of a statesman. STATES'MANSHIP, n. qualifications or skill of a statesman. STATE-PAPER, public official document. STATE-PRISONER, one charged with political offenses. STATE-ROOM, one of the principal magnificent apartments

in a palace or princely mansion: private cabin in a ship; private room (usually for passengers) on a vessel. STATE-TRIAL, a trial for political offenses. SINGLE STATE, the unmarried condition; in *OE.*, individuality.—SYN. of 'state, n.': condition; situation; circumstances; point; crisis; height; rank; community; public; commonwealth; republic; quality; dignity; grandeur.

STATE, n. in *OE.:* contraction for ESTATE.

STATE IN THE UNITED STATES OF AMERICA: one of the distinct and independent commonwealths which by organizing themselves into a Union as a federal republic—with recognition of one another as in such Union yet severally distinct—do thereby delegate and combine their individual sovereignty in such measure as to constitute one Nation; to which pertains the undivided sovereignty in all matters duly designated as of common concern.—The government of the United States is a substantive part of the government of every several State; and a citizen in any State is, by that fact, a citizen of the United States.—See CONSTITUTION OF THE UNITED STATES: FEDERAL GOVERNMENT: CONFEDERATION OF THE THIRTEEN AMERICAN COLONIES.

STATEN ISLAND, *stăt'ĕn:* beautiful and picturesque island, comprising Richmond co., N. Y.; bounded n. by the Kill van Kull; e. by New York Harbor, New York Bay, and the Narrows; w. by Staten Island Sound; s.s.e. by Raritan Bay and the lower bay of New York: extreme length 14 m., extreme breadth 8 m.; 58½ sq. m.; named by the Dutch in honor of the staats-general. Its surface is pleasantly diversified, rising from the water's edge to central wooded heights, affording charming sites for suburban residences. It is connected with New York and N. J. by several lines of ferry-boats; is traversed by the Staten Island Rapid Transit railroad; and contains 5 towns, Castleton, Middleton, Northfield, Southfield, and Westfield, with numerous villages and pleasure resorts, as Tompkinsville, Stapleton, and Clifton on the e. shore, New Brighton, Sailor's Snug Harbor, Castleton, Port Richmond, and Elm Park on the n. shore, with St. George and South Beach at the extremities. A new railroad bridge connects the island with N. J. near Elizabeth, being a part of the Baltimore and Ohio railroad system. At the Narrows point are Forts Tompkins and Wadsworth, with Battery Hudson and a line of water-batteries, while Fort Hamilton is on the opposite (Long Island) shore, with Fort Lafayette between. A bill was introduced into congress 1890 to authorize the construction of a tunnel under New York Bay to connect S. I. with Long Island, presumably to promote a scheme for the creation of a great ocean steamship port at Montauk, L. I., and to give the trunk lines of railroad centring on the N. J. shore a Brooklyn terminus.—Pop. (1880) 38,991; (1890) 51,693; (1900) including entire borough, 67,021; (1910) 85,969.

STAT'EN ISLAND: island off the s.e. point of Tierra del Fuego, from which it is separated by the Strait of Le Maire; about 45 m. long from e. to w., and about 10 m. at its greatest breadth. Its shores are much indented. Its e. extremity is Cape St. John, lat. 54° 42′ s., long. 63° 43′ w. The surface is mountainous, descending to the sea in steep slopes and precipices; its general character similar to that of Tierra del Fuego.

STATES, or ESTATES, in Politics: classes of the population in a country, who either directly or by their representatives take part in the government. In all European countries where the northern conquerors established themselves, the rudiments of representative government appeared in the form of assemblies brought together to deliberate with the sovereign on the common weal. These assemblies at first consisted of the two estates—Clergy (q.v.) and Nobility (q.v.) or baronage, who together constituted the whole free population of the realm; the nobility including not merely the greater barons, but the whole body of freeholders. As the burgesses gradually emancipated themselves, and rose into importance, they formed a third estate (see BURGESS). In France, we find the *tiers état* (third estate), or citizens, recognized in the States-general (q.v.) 1302. In Scotland, the earliest occasion on which the burghs are mentioned as attending and concurring in a grant of taxation, is in the parliament at Cambuskenneth 1326. The burgesses, represented by the commissioners for the burghs, continued in Scotland a separate estate, not, as in England, amalgamated with the knights and lesser barons who, in the Scots parliament, were always classed with the baronage. The lesser barons were, however, first allowed, and latterly enjoined, to appear by representatives; and the three estates, clergy, barons, and burgesses, all sat and deliberated in one house. In England, on the other hand, the knights and lesser barons were at an early period separated from the greater barons, and conjoined with the burgesses into the third estate, which occupied a separate chamber from the lords spiritual and temporal. This peculiarity in the original constitution of the *tiers état* of England necessarily gave it a weight which it did not possess elsewhere, and exercised an important influence on the constitutional history of the country. As the peasants became emancipated, we find them also in some countries taking share in the legislative power, either as a part of the *tiers état*, or, as in Sweden, forming a fourth estate. The four estates, nobles, clergy, citizens, and peasants, were recognized in Sweden till 1866; and in the Swedish legislature, as constituted, each had its separate chamber. Throughout Europe, except in Russia (though in some small German states, such as Mecklenburg, the diet, representing only the landed gentry and the towns, has very little authority), the co-operation of the estates with the sovereign in the legislative power is more or less recognized. Some assemblies have but one chamber, but more of them have two. The lower chamber is always wholly, or partly, elective: but

consists sometimes of separate delegates from the different orders of the community, and has representatives of landed proprietors, of towns, of peasants, and of traders and manufacturers. The upper house or senate is in some constitutions hereditary; in some, it consists of members named by the sovereign or by the nobility, or some other class of the community; and often it combines these elements. In a few instances, it is elected by the same constituency as the lower house, and differs only in the higher property qualification required of its members.

STATE'S EVIDENCE: testimony of an accomplice in crime against his fellows, given in court in consideration of an expressed or implied promise of the prosecution that the informer shall go unpunished. The fact that he purchases impunity for himself by fixing guilt on his accomplices often renders his testimony suspected; hence usually S. E. carries little weight unless confirmed by testimony not tainted by self-interest.

STATES'-GENERAL (Fr. *états géneraux*): name, prior to the Revolution of 1789, for the convocation of the representative body of the three orders of the French kingdom —the nobles, the clergy, and the people; so named in distinction from the *états provinciaux*, or assemblies of the provinces. As far back as the time of Charlemagne there were assemblies of clergy and nobles twice a year to deliberate on public concerns; and in these assemblies the extensive body of laws bearing the name Capitularies of Charlemagne was enacted. The succeeding centuries, however, were adverse to free institutions; and these national convocations, becoming gradually less important, seem to have ceased about 70 years after Charlemagne's death. From that time forward, there is no trace of any national assembly in France till 1302, when the *états généraux*, including the three orders, clergy, nobles, and citizens, were convened by Philippe le Bel, with the view of giving greater weight to the course adopted by the king in his quarrel with Pope Boniface VIII. In 1314 we find the S.-G. granting a subsidy; during the reigns of Philippe IV. and his successor, the imposition of taxes by arbitrary authority was the subject of general discontent; and 1355, the states were strong enough to compel the government to revoke the taxes so imposed. The S.-G. however, though their consent seems in strictness to have been considered requisite for any measure imposing a general taxation, had, unlike the assemblies under the Carlovingian kings, no right of redressing abuses except by petition, and no legislative power. Under Charles VI. and Charles VII. the S.-G. were rarely convened, and it was often found more convenient to ask supplies from the provincial states. But as the royal authority increased, the formality of any convention of states general or provincial gradually ceased to be regarded as indispensable, and a final and unsuccessful struggle for immunity from taxation took place at the S.-G. of Tours 1484. Louis XIII. convoked the S.-G., after a long interval, 1614, but dismissed them for looking too closely into the finances; and from that time till the Revo

lution, the crown, with tacit acquiescence of the people, exercised the exclusive powers of taxation and government. In 1789 the memorable convention of the S.-G. took place, which ushered in the Revolution. As soon as they had assembled, a dispute arose between the two privileged orders and the third estate as to whether they should sit and vote in one chamber or separately. The *tiers état*, of its own authority, with such deputies of the clergy as chose to join them—none of the nobles accepting their invitation—assumed the title of *Assemblée Nationale*, a name by which the S.-G. had previously been sometimes designated. See ASSEMBLY, NATIONAL.

The name S.-G. is applied also to the now existing legislative body (in two chambers), of the kingdom of the Netherlands (q.v.): so called in distinction from the provincial states, which are legislative and administrative assemblies for the several provinces.

STATICE, n. *stăt'ĭ-sē* [Gr. *statĭkē*, an astringent herb—from *statĭkos*, making to stop]: genus of plants of nat. order *Plumbagineæ*, having a funnel-shaped, membranaceous, and plaited corolla; the flowers in spikes. Several species grow near the sea, on muddy shores and in salt marshes. the root of *S. Caroliniana*, called Marsh-rosemary, is used in N. America for all the purposes of kino and catechu, and is a very powerful astringent: see MARSH-ROSEMARY.

STATICS, n. *stăt'ĭks* [Gr. *statĭkos*, at a standstill—from *statos*, standing still]: branch of mechanics which treats of the equilibrium, weight, pressure, etc., of bodies at rest. STATIC, a. *-ĭk*, or STAT'ICAL, a. *-ĭ-kăl*, pert. to bodies at rest or in equilibrium. STAT'ICALLY, ad. *-kăl-lĭ*—*Statics*, as the science of the equilibrium or balancing of forces on a body or system of bodies, has gradually advanced since the days of Archimedes to its present vast development. Singularly, though most of its simpler theorems are generally known, indeed are almost popular, in no science is elementary teaching so defective. The ordinary proofs of its fundamental principles, e.g., the *Parallelogram of Forces*, the *Principle of the Lever*, etc., are founded usually on the supposition that a body in equilibrium is *absolutely at rest*. Now, any one who knows that the earth rotates about its axis, that it revolves about the sun, that the sun is in motion relatively to the so called fixed stars; that *they* are, probably, in motion about something else which itself is in motion, etc., will at once see that there is no such thing as absolute rest; and that *relative rest* or motion, unchanged with reference to surrounding bodies, is all that is meant by equilibrium. He will then, at once, see that the foundations of statics are to be sought in the LAWS OF MOTION (q.v.). And, in fact, Newton's Second Law of Motion gives the necessary and sufficient conditions of equilibrium of a single particle under the action of any forces; while his Third Law, with the annexed Scholium, gives these conditions for any body or system of bodies whatever.

The simplest statement of the conditions of equilibrium of a rigid body which can be given, is that furnished by this Scholium of Newton's now known by the name Prin-

ciple of Energy (see FORCE) or Work. It is as follows: A rigid body is in equilibrium if, and is not in equilibrium unless, in *any* small displacement whatever, no work is done on the whole by the forces to which it is subject. In the case of what are called the *Mechanical Powers* (q.v.), this is equivalent to the statement that work expended on a machine is wholly given back by the machine—or that the work done by the *power* is equal to the work spent in overcoming the *resistance.*

It is shown in the geometrical science of Kinematics that any motion whatever of a rigid body can be reduced to *three* displacements in any three rectangular directions, together with *three* rotations about any three rectangular axes—so that the equilibrium of a rigid body is secured if no work be done on the whole in any of these *six* displacements. There are thus six conditions of equilibrium for a rigid body under the action of any forces—and these are reduced to *three* (two displacements and one rotation), if the forces are confined to one plane; and to *one* (a displacement), if the forces act all in one line.

Equilibrium may be *stable, unstable,* or *neutral* (see STABILITY AND INSTABILITY). It is said to be stable, if the body, when slightly displaced in any way from its position of equilibrium, and left free, tends to *return* to that position. It is unstable, if there is any displacement possible, which will leave the body in a position in which it tends to *fall further away* from its position of equilibrium. It is neutral, if the body, when displaced, is still in equilibrium. It is easily shown, but space is lacking here for the proof, that a position of stable equilibrium is, in general, that in which the Potential Energy (see FORCE) of the body is a minimum—of unstable equilibrium, where it is a maximum (for some one direction of displacement at least)—of neutral equilibrium, where the potential energy remains unchanged by any small displacement. Thus, a perfect sphere, of uniform material, is in neutral equilibrium on a horizontal plane—while an oblate spheroid, with its axis of rotation vertical, is in stable equilibrium; and a prolate spheroid, with its axis vertical, is in unstable equilibrium on the plane. Similar statements hold for other than rigid bodies. Thus, a chain, or a mass of fluid, is in stable equilibrium when its potential energy is least, i.e., when its centre of gravity is as low as possible. This simple statement is sufficient for the mathematical solution of either question. —See DYNAMICS.

STATIC SENSE: refers (1) to the organs involved in the maintenance of bodily equilibrium and to the sensations connected with their function. The preservation and alteration of bodily position and orientation involve a large number of organs (the muscles, tendons, joints, skin, viscera, etc.), whose activities give rise to a variety of sensation qualities (muscular, articular and

cutaneous pressure, strain, etc.). Besides these general factors there exists in the semicircular canals of the inner ear, a special organ of equilibration. The 'static sense' more properly refers (2) exclusively to this organ and its functions. These functions are, in part, purely reflex. They are set into operation by a disturbance of the liquid (endolymph) contained within the canals. This disturbance, however, is thought to be responsible also for the experience of dizziness or giddiness which results, e.g., from whirling upon the heels or from a sudden quick movement of the head. Change in the rate of progressive movement—as in springing from a walk into a run—is supposed to be registered by a neural apparatus (otolith-organ) in the vestibule, an enlargement of the inner ear that connects the semicircular canals with the cochlea. It is not certain that this apparatus mediates any characteristic quality of sensation.

STATION, n. *stā'shŭn* [F. *station,* a station—from L. *statĭō or statĭōnem,* a station, a post—from *stārĕ,* to stand: in mid. L. and even in classical times, *statĭō* was applied to a stall or shop]: the spot or place where a person stands; post assigned; position; rank or condition of life; office; a halting or starting place on a railway; a police-office; in *bot.,* the region occupied by any particular plant, being the locality which presents the conditions most favorable for its growth and development; in *mil.,* the quarters of a regiment, or the place where located; in *nav.,* a port where there is accommodation for ships of war; also, the place assigned to a ship of war in foreign parts; in *OE.,* the act of standing: V. to place; to appoint to the occupation of a certain post or point. STA'TIONING, imp. STA'TIONED, pp. *-shŭnd.* STA'TIONAL, a. *-shŭn-ăl,* pertaining to a station. STA'TIONARY, a. *-ėr-ĭ,* fixed; not moving; not advancing; not improving. STA'TIONER, n. *-ėr* [so named from being originally one who had a *station* or *stall* in a market-place]: *originally,* a bookseller; *now,* a dealer chiefly in paper, pens, ink, and all other materials employed in writing. STA'TIONERY, n. *-ėr-ĭ,* articles sold by stationers: ADJ. of or belonging to a stationer. STATION-MASTER, an officer in charge of a railway station. STATIONARY ENGINE, a fixed steam-engine for drawing carriages on railways by means of a rope. STA'TIONS OF THE CROSS, certain points in the narrative of the passage of Christ from the judgment-seat to the cross, selected as subjects for meditation at fixed spots in the church and sometimes in the parish itself; the places where ecclesiastical processions rest, or which are visited in rotation by individuals, for the performance of any act of devotion; *formerly,* in the *Rom. Cath. Chh.,* the weekly fasts of Wednesdays and Fridays (see STATIONS, in Rom. Cath. Observance). STATIONERS' HALL, govt. institution in London, founded 1553, where printed works, etc., are registered in every case of copyright. SYN. of 'station, n.': depot; stall; post; office; situation; position; employment; character; rank.

STA'TIONS, in Roman Catholic Observance: certain places reputed of special sanctity, appointed to be visited as places of prayer. In this sense, the name is applied particularly to certain churches in the city of Rome, which, from an early period, have been assigned for the special visits of the faithful on stated days: the names of these churches are found on the several days in the Roman missal prefixed to the liturgy peculiar to the day.—The word is employed also in reference to a very popular and widely-received devotional practice of the Roman Catholic Church, known as that of 'The Stations of the Cross,' in which several incidents of the last earthly days of the Lord Jesus are enumerated; viz.: (1) his sentence to death; (2) taking up the cross; (3) falling under the cross; (4) meeting his mother; (5) Simon of Cyrene carrying the cross; (6) the wiping of the face of the Lord Jesus by St. Veronica (q.v.); (7) his second fall beneath the cross; (8) his words to the women of Jerusalem; (9) his third fall under the cross; (10) his being stript of his garments; (11) his crucifixion; (12) his death; (13) taking his body down from the cross; (14) his burial. This devotion prevails in all Roman Catholic countries.

STATISTICS, n. plu. *stă-tĭs'tĭks* [F. *statistique,* statistics—from Gr. *stătos,* fixed, placed]: facts, largely numerical, more or less systematized, regarding the condition of a nation, or of any society, in its domestic economy, in the health and longevity of its people, in its population, wealth, trade, etc., science of collecting and arranging all the numerical facts relating to any subject. STATIS'TIC, a. *-tĭk,* or STATIS'TICAL, a. *-tĭ-kăl,* of or relating to the state or condition of a people or nation with respect to extent, population, wealth, etc. STATIS'TICALLY, ad. *-lĭ.* STATISTICIAN, n. *stăt'ĭs-tĭsh'ăn,* one who is skilled in the matter of statistics. STATIST, n. *stāt'ĭst,* one skilled in knowledge of the facts regarding the condition of a nation, etc.; a statistician; in *OE.,* a statesman; a politician.—*Statistics* as a branch of Political Science are concerned with the gathering and compilation of facts, largely numerical, bearing on the condition, social, moral, and material, of a *state,* or other large group of people. The word statistics was used first in the middle of the 18th c., by Prof. Achenwall of Göttingen, who has been called 'the father of modern statistics.' The principle at the foundation of statistics is, that the laws which govern nature, especially those which govern the moral and physical condition of mankind, are constant, and are to be discovered by investigation and comparison of phenomena extending over a very large number of instances. Accidental diversities tend to neutralize each other, their influence diminishing as the area of investigation increases; and if that area be sufficiently extended, they so nearly disappear as to be disregarded. While the length of

a single life cannot be counted on, an average of 1,000 or 10,000 lives gives us a constant quantity, sufficiently near the truth to answer the purposes (e.g.) of insurance companies. Even the acts which are the most purely voluntary, as done by individual men, have been found subject to laws which, relative to the masses which make up society, are invariable in like circumstances and are in large measure discoverable.

The science of S. has a twofold relation to political and social economy. The facts collected by the statist are the bases on which political economy rests: their application to social and economical problems is an appeal from imagination or theory to fact. But the statist must be guided by the political economist as to the direction in which to extend his investigations: without political economy we should have had no statistics.

Every branch of human knowledge, every sphere of human physical, social, intellectual, moral, religious life—thus every science—has its special S. The most common application of the term is in the department of political economics, relative to trade, industry, finance, taxation, and national condition, especially as to material welfare; in which department S. have been classified as relative—(1) to the nature of wealth and its production and growth in a community; (2) to inland and foreign trade; (3) to taxation and finance; (4) to currency, banks, and prices; (5) to wages and hire of labor, and to division of employments; (6) to the functions of the state as regards interference with the economic relations of its citizens.

The statistical section added to the Brit. Assoc. for Advancement of Science, 1833, and the London Statistical Soc., founded 1834, have made valuable contributions to this science. An international statistical congress convened in Brussels 1853, at the suggestion of J. C. G. Kennedy, supt. of the U. S. census; and its successive meetings have been held in great cities—Paris, Vienna, London, Berlin, Florence, St. Petersburg, etc. Adolph Quetelet, eminent French statistician, gave invaluable aid to its success in its work of systematizing the S. of nations represented. Statisticians from this country also rendered notable service.

S. may be said to be specially in the province of government: its most important subjects cannot be investigated without unrestricted access to govt. offices; and the ordinary administration of govt. is continually affording opportunities for collection of statistical facts. For some time past, S. have largely occupied the attention of the more enlightened European states. The statistical reports issued by the various departments of the French govt. deserve especial praise for comprehensiveness and for clearness of arrangement. In Great Britain, a department of the board of trade has, since 1832, been charged with collecting and publishing S. of wide range.

In the United States there is an immense field for statistical information; and official publications are very numerous. Each executive dept. of the general govt. issues weekly, monthly, quarterly, or annual publications

purely statistical, besides regular and special issues, for diffusion of specific information. Of the former class, the treas. dept. issues four of large comprehensiveness: the annual reports of the sec. on (1) *Finance*, (2) on *Foreign Commerce, Immigration, and Tonnage*, and those of its bureau of S.; (3) the *Quarterly Report* on imports, exports, immigration, navigation, trade, industries, etc.; (4) the *Statistical Abstract of the United States* (annual). The dept. of the interior comprises many bureaus—e.g., education, Indian affairs, U. S. land office, the various surveys, etc.; each of which issues regular reports, some being the costliest publications in the country. The bureau of education, besides its very full annual reports on the educational institutions of the country, has been issuing for several years frequent *Circulars of Information*, dealing with both statistical and historical matters. The new dept. of agriculture issues an annual report, monthly crop reports, and daily weather reports, and from time to time special pamphlets on matters of current interest to agriculturists. The state dept has been publishing, since 1880, very valuable reports from the U. S. consuls, giving statistical information of an industrial and commercial character from all the great foreign cities of the world, and 1891 was issuing special reports on the American republics. State govts. also publish a variety of such information, concerning their own condition, progress, and needs, many doing so to attract capital, skilled labor, and immigration. Since 1872, particularly since 1884, there has been a noticeable movement among the states to create bureaus of statistics of labor and industry; and 1891 there were a U. S. dept. of labor, similar bureaus in 24 states, and a national assoc. of chiefs of bureaus.—There was (1891) also a National Statistical Assoc., incorporated, and composed largely of publicists and specialists in professional work, with headquarters in Boston. To this mass of periodical statistical literature should be added the innumerable trade journals, and the valuable almanacs now issued by the great newspapers.

STATOBLASTS, n. plu. *stăt'ō-blăsts* [Gr. *stātos*, stationary; *blastos*, a bud]: in *zool.*, certain reproductive buds developed in the interior of polyzoa, but not set at liberty till the death of the parent organism.

STATUA, n. *stăt'ū-ă:* OE. for STATUE.

STATUE, n. *stăt'ū* [F. *statue*—from L. *statuă*, a statue, an image—from *status*, a standing, position—from *sto*, I stand: It. *statua*]: representation of a living being in some solid substance, e.g., marble, stone, bronze, etc.; an image. V. in *OE.*, to place as a statue; to form as a statue. STAT'UARY, n. *-ĕr-ĭ*, one who carves images or statues; art of carving figures out of stone, marble, etc., to represent human beings or animals; a collection of statues, or statues considered collectively (see SCULPTURE). STAT'UED, a. *-ūd*, furnished with statues. STAT'UESQUE', a. *-ū-ĕsk'*, having the character of a statue. STAT'UETTE', n. *-ĕt'*, a small statue.

STATURE, n. *stăt'ūr* [F. *stature*—from L. *statūrā*, an upright posture, height or size of the body—from *sto*, I stand: It. *statura*]: the height or size of any one standing. STAT'URED, a. *-ūrd*, arrived at full stature; proportioned.

STATUS, n. *stā'tŭs* [L. *status*, a standing—from *sto*, I stand]: standing or place; the state or condition of a thing; position of affairs; condition; rank.

STATUTE, n. *stăt'ūt* [F. *statut*, a statute—from L. *statūtus*, fixed or settled, appointed; *statuĕrĕ*, to fix—from *status*, position (see STATE)]: an act of the legislature or supreme power of a state commanding or prohibiting a thing; an enactment; a written law (see STATUTES, LEGISLATIVE): act of a corporation or of its founder. STAT'UTABLE, a. *-ū-tă-bl*, according to statute or law; made or being in conformity to statute. STAT'UTABLY, ad. *-blĭ*. STAT'UTORY, a. *-tėr-ĭ*, enacted by statute. STATUTE BOOK, a book containing statutes or laws; the whole body of the laws of a nation. STATUTE OF DISTRIBUTIONS (see DISTRIBUTIONS, STATUTE OF). STATUTE OF FRAUDS (see FRAUD), English statute requiring certain contracts and agreements to be in writing, in order to be binding. STATUTE OF LIMITATIONS, a law which prescribes the time within which any action at law must be commenced (see LIMITATION).—SYN. of 'statute, n.': enactment; act; edict; regulation; decree; proclamation; rule; ukase.

STATUTES, LEGISLATIVE: those laws enacted by authorized legislative bodies, in accordance with prescribed procedure. All laws may be divided into common law and statutory law, the former unwritten, the latter written: see LAW: COMMON LAW. The theory as to the common law in England—and in the United States, in which from the first it was an inheritance from England—is, that it consists merely of ancient usages, accepted by all, of which the written exposition has or may have perished, but which tradition has kept alive; and much of the common law necessarily consists of what has sometimes been called judge-made law—a department often ignorantly denounced as illegal or unconstitutional, but which is a necessary part of every code, under whatever name disguised. The legislature of Great Britain consists of the king, lords, and commons in parliament assembled; and the statutes which they pass were likened by Sir Matthew Hale (q.v.) to written contracts or indentures—the general public being bound, by their respective agents as if by solemn deed. There is no legal mode of altering the previously existing law, except by a statute passed by a competent legislature; though there are other ways of modifying the law so far as mere details of administration are concerned. Statutes (acts of congress, acts of parliament, etc.) all are founded on the theory that the legislature has inherent right to alter all previous laws or S.; and though sometimes great and leading S. have been declared unalterable by any future legislation, this restriction is obviously utterly futile, and inconsistent with the idea of a legislature, except in cases where the

statute is in the nature of a contract, or grants some privilege under which valuable rights become vested. There are certain important rules as to the interpretation of S., the chief business of the various courts of law and of equity being to construe or interpret the S. The leading rule in construing S. is, that the words are to be taken in their ordinary grammatical sense, unless the context shows that they are used in some other sense. All other rules resolve more or less into this. There is also a well-known rule that penal S. are to be construed less strictly than those of a remedial kind. Another rule is, that a subsequent statute repeals one that is prior, either expressly or by necessary implication, if the prior one is inconsistent in substance. Though it might seem an easy task to construe what is meant by a statute, it is in practice so far from easy that it requires a special training and long experience—the chief business of lawyers being to acquire this art.

The acts of the U. S. congress and of the legislature of the several states, of the Brit. parliament, and of other legislative bodies, are called statutes: these qualify and alter the Common Law (q.v.); and the sum of them constitutes the 'statute law,' or 'positive law,' as distinguished from the 'common law,' or the unwritten law. See PROCEDURE, RULES OF LEGISLATIVE AND DELIBERATIVE.—A *penal* S. prohibits or commands under penalty. A *declaratory* S. determines authoritatively the meaning of another S. or common law.—Statutes are either *public* or *private:* a *public* S. has force either throughout the whole commonwealth or in a restricted locality; a *private* S. concerns only particular persons. A *perpetual* S. runs for an indefinite time, or till repealed; a *temporary* S. runs for a definite period.—It is a principle of law that when a S. gives a power, it gives by implication all the necessary legal authority for exercising that power. In the United States, any S., whether of the federal congress or of a state legislature, that contravenes a provision of the U. S. constitution is so far void: the same is to be said of the statutes of the several states with respect to their several constitutions. But if only a part of a S. is in conflict with constitutional provision, that part alone is void: the rest of the S. has the force of law if it can stand by itself. Usually, in the United States, statutes take effect immediately on completion of the formalities of enactment; but the S. itself may set a date for its coming into force.—The statutes of the Brit. parliament are in force when they have received the assent of the sovereign.—In France, the statutes of the national legislature take effect in each department of the republic as many days after promulgation in the same as there are distances of 20 leagues between the place of promulgation and the seat of govt.—The *Revised Statutes of the United States* is a compilation of the acts of congress approved by congress 1874, June 22, and thereby enacted into law. That first ed. of the *Revised Statutes* comprised all the laws of the United States

in force 1873, Dec. 1. A second ed. was pub. 1878, comprising the first ed. as amended by the 43d and 44th congresses. A supplement was pub. 1881, containing the acts of congress 1874–80. The *Revised Statutes* is the authentic and authoritative expression of the laws, and must be accepted as such, without reference to the original acts of congress, except in cases of ambiguity or uncertainty: then the statutes themselves may be quoted to exhibit the true intent of the law-makers. The U. S. senate and the U. S. house of representatives has each a standing committee on 'revision of the laws of the United States.'—See ACT OF CONGRESS: BILL: CONGRESS: PARLIAMENT.

STAUNCH, a. *stânsh* [see STANCH]: sound; firm in principles, or in the support of a cause; trusty zealous. STAUNCH'LY, ad. *-lĭ*. STAUNCH'NESS, n. *-nĕs*.

STAUNTON, *stawn'ton:* city, cap. of Augusta co., Va., on the Chesapeake & Ohio and on the Valley Branch of the Baltimore & Ohio railroads; about 40 miles northwest of Charlottesville and 55 miles north of Lynchburg. It was settled in 1745 by people from the northern part of Ireland. In 1802 it was incorporated and in 1871 it was chartered as a city. From its importance as a strategical point Staunton became the objective point of many campaigns of the Civil War, but was not occupied by the Union troops until 1864, June 6, when Gen. Hunter entered the place without opposition and, after destroying the railroad several miles east and west of the place, and burning much public property and many warehouses, marched toward Lynchburg. It was again occupied by Gen. Sheridan's cavalry 1865, March 2, and the railroad and public property were again destroyed. It is in an agricultural region and has considerable manufacturing interests. The chief manufacturing establishments are chemical works, canneries, foundry, and other industrial works connected with farming and farm products. The principal public buildings are the Western State Hospital for Lunatics, the Virginia School for the Deaf and Blind, 16 churches, and the schools. The educational institutions are the State school mentioned, the Mary Baldwin Seminary, Virginia Female Institute, Staunton Military Academy, two business colleges, two other private schools, and public and parish schools. The four banks have a combined capital of $600,000; the annual amount of business is about $30,000,000. The government is vested in a mayor and a council of 12 members, each of whom holds office two years. Pop. (1900) 7,289; (1910) 10,604.

STAUNTON, *stân'ton*, HOWARD: 1810–1874, June 22; b. England. After studying at Oxford, he settled in London, and became famous for his skill at chess and his acquaintance with the works of Shakespeare and the other Elizabethan dramatists. He won from St. Amand the chess championship of Europe 1843; and as a writer on chess held a place among the most eminent authorities on the game. He was long the editor of a paper devoted to

chess, and edited a chess column in the *Illustrated London News.* Among his books were: the *Chess-player's Handbook;* the *Chess Tournament; Chess Praxis;* editions of Shakespeare's *Plays and Poems,* one in 3 and another in 4 vols.; *Memorials of Shakespeare;* and *The Great Schools of England.* He died in London.

STAUN'TON, River: stream in s.w. Va., having its source in the Alleghany Mts. in Montgomery co.; passing through a notch in the Blue Ridge Mts.; in its s.e. course separating the counties of Bedford, Campbell, and Charlotte on the n. from those of Franklin, Pittsylvania, and Halifax on the s.; and at Clarksville, Mecklenburg co., uniting with the Dan to form the Roanoke river. It is 200 m. long and falls about 1,000 ft. in the first 20 m. of its course.

STAUPITZ, *stow'pĭts,* Johann von: date and place of birth not known; d. Salzburg, Austria, 1524, Dec. 28: Rom. Cath. ecclesiastic and friend of Luther. He studied at Tübingen and other universities; was prior of an Augustinian convent 1500; was invited by Frederick the Wise to aid in establishing the University of Wittenberg, was prof. of theology and dean there 1502; vicar-general of the German convents of his order 1503; introduced the reading of the Scriptures in the same in place of St. Augustine's writings 1512; was substitute for the Abp. of Salzburg in the Lateran council the same year; and abbot of the Benedictines, vicar of the abp., and court preacher at Salzburg 1519. By him, Luther was turned from ascetics and metaphysics to the study of the doctrine of redemption, was made prof. at Wittenberg, and preacher, was appointed inspector-gen. of 40 convents, also was accompanied by Staupitz in the discussion of Augsburg; but Staupitz followed no further in the Reformation. He wrote some tracts, e.g., on the love of God and the following of Christ; and 10 of his letters have been published.

STAURO, prefix *staw-ro* [Gr. *stauros,* a cross]; pertaining to or resembling a cross; having processes in the form of a cross.

STAUROLITE, n. *staw'rō-līt* [Gr. *stauros,* a cross; *lithos,* a stone]: a silicate of alumina and iron of a dull or reddish-brown color whose crystals often intersect each other—occurs embedded in mica-, talc-, or clay-slate: also Staurotide.

STAVANGER, *stâ-vâng'ghėr:* town, cap. of a large dist. in the s.w. corner of Norway, on the Stavanger Fiord, 35 m. n.w. from the Naze, 100 m. s. of Bergen. It is a prosperous port. Its trade depends mainly on various branches of the fishing industry; and it has two good harbors, protected by islands. The city dates from the 11th c., and has ancient cathedral, built 1013; also very fine schools and municipal buildings. There are cloth-manu-

factories and distilleries; also ship-building, and an export trade. Pop. (1901) 30,613.

STAVE, n, *stāv* [another form of STAFF, which see: Icel. *stafr*, a pole; *stef*, a stave in a song]: a pole of some length; one of the bars of which a cask is made up; a metrical portion; in *music*, the five parallel lines, and the four contained spaces on and within which musical notes are written; in *Scot.*, a verse, or so much of the psalm as is given out at once by the precentor, to be repeated by the congregation: V. to break a hole in; to burst, as a cask; to furnish with staves. STA'VING, imp. STAVED, pp. *stāvd:* ADJ. furnished with staves. TO STAVE IN, to break a hole in, as in a cask.

STAVESACRE, *stāvz-ā'kr* [corrupted from Gr. *staphis*, a grape; *agrios*, wild], (*Delphinium staphisagria*): plant, popularly called Louse-wort, species of Larkspur (q.v.), native of s. Europe. The seeds have been used in medicine from ancient times. They are too violently emetic and cathartic for safe use; but in powder they are applied to cutaneous eruptions, and are used for killing lice. Their properties depend on an alkaloid, *Delphinia* ($C_{24}H_{35}NO_2$), now used in medicine instead of the seeds, chiefly in rheumatism and neuralgia.

STAVROPOL, *stáv-rō'pōl:* government in Russian Caucasia, bounded e. by the Caspian Sea, s. by the Caucasus; 27,000 sq. m. The chief rivers are the Kuban and Terek, and the Kuma. In the s.w., where the soil is fertile, and produces millet and wheat, agriculture is the chief employment; in the n.e. the inhabitants lead a nomad life. Vineyards line the banks of the Terek and Kuma, and mulberry-trees are cultivated for rearing of silk-worms.—Pop. (1901) 873,863.

STAW, v. *staw* [Ger. *stauchen*, to stow or cram into a cask or vessel: Low Ger. *stauen*, to pack, to dam]: *prov. Eng.* and *Scot.*, to glut; to clog; to surfeit; to disgust. STAW'ING, imp. STAWED, pp. *stawd. Note.*—STAW may be only a broad pronunciation of *stall*, in the sense of 'standing-place.'

STAWELL: Australia, a town of Victoria, 176 m. nw. of Melbourne. The chief buildings are the municipal offices, some churches, mechanics' institute, and theatre. The quartz reefs of the Pleasant Creek gold-fields are exploited, and cyanide works are operated. Agriculture is an important industry, and vine-culture is carried on. Pop. (1901) 5,296.

STAY, n. *stā* [Icel. and Dut. *stag*, the stay of a ship Icel. *staga*, to bind, to fasten]: in a *ship*, strong rope extended from the head of a mast down to some part of the vessel to support the mast—the stays of a ship are distinguished by different names (see RIGGING: SAIL). STAY-SAIL, sail extended on a stay. MAIN-STAY, chief dependence. TO MISS STAYS, in *navigation*, to fail in tacking.

STAY, n. *stā* [Icel. *stöd;* Norw. *styd,* a stake, a support. Dut. *staede;* OF. *estaye,* a prop or supporter: Lang. *estaia,* residence]: continuance or abode in a place; a lingering; a prop or support; in *engin.,* a part in tension to hold parts together; in *OE.,* restraint; prudence; sobriety of judgment: V. to delay; to obstruct; to hinder from progression; to keep from departure; to repress; to remain or continue in a place; to wait; to forbear to act; to stop; to stand still; to wait for; to rely; to prop or hold up; to sustain with nourishment, as the stomach; to rest confidently on; in *OE.,* to give ceremonious or submissive attendance; to satisfy a strong desire. STAY'ING, imp. STAYED, pp. *stād.* STAYS, n. plu. *stāz,* a stout inner waistcoat, usually stiffened with whalebone, worn by females; rods or tubes which connect and stay the flat ends of the boiler of a locomotive. They are made either of copper, wrought-iron, or steel. Bar stays and tube stays, also called screwed stays, are first screwed into the ends of the shells or fire-boxes, and then secured either with nuts or by riveting. Gusset stays are riveted. STAY-BOLT, in *mech.,* a rod connecting opposite plates to prevent them being bulged out. STAY-LACE, a lace or string for fastening stays. STAY-MAKER, one whose occupation is to make stays.—SYN. of 'stay, v.': to continue; forbear; wait; attend; stop; dwell; withhold; repress; delay; obstruct; hinder; prop; support; restrain.

STEAD, n. *stĕd* [Goth. *staths;* Dan. *sted;* O. Dut. *stede,* a place: Icel. *stadr,* a stead: Sw. *stadd,* situated, *placed*] place or room which another has or might have—preceded by *in;* denoting the replacing, or filling the place, of another; the frame of a bed, as bed*stead;* a place or locality, home*stead: V.* in *OE.,* to help; to support; to bestead; to fill the place of another. STEADING, or STEDDING, n. *stĕd'ĭng* [Sw. *stadig,* standing in its place; *stadd,* situated]; in *Scot.,* a farmhouse and offices; a homestead. TO STAND IN STEAD, to stand in support or assistance; to be of advantage; to perform duties due from another. TO STAND IN GOOD STEAD, to render effectual assistance; to give good service or assistance.

STEAD, *stĕd,* WILLIAM THOMAS: journalist: b. Embleton, England, 1849, July 5; son of a Congregational minister. He received a limited education; was a mercantile clerk for several years; became editor of *The Northern Echo* at Darlington, 1871; asst. editor of the *Pall Mall Gazette* (London) under John Morley, 1880; editor-in-chief on Morley's resignation 1883; and editor of the *Review of Reviews* (monthly), founded by him, 1890, Jan.; which has taken high rank among magazines, and has large circulation in the United States. Under his editorship the *Pall Mall Gazette* became the most notable and incisive of London newspapers in its uncompromising attacks on social immoralities; and Stead was imprisoned six months for violations of law committed to expose ne-

farious practices toward women and children (see *The Maiden Tribute of Modern Babylon,* 1885). His exposures resulted in the passage of a long-needed amendment to the criminal law. Stead is a strong advocate of the rights of workingmen. He published *No Reduction, No Rent: a Plea for the plan of Campaign,* after visiting Ireland (1886); *The Truth about Russia; The Pope and the New Era* (1890); and *If Christ Came to Chicago* (1893); *The Labor War in the U. S.* (1894); *Satan's Invisible World* (1897); *The United States of Europe* (1899), and numerous tracts, pamphlets and newspaper articles.

STEADFAST, a. *stĕd'făst* [Sw. *stadig,* fixed, stable: Ger. *stätig,* continual: Icel. *steadfastr,* steadfast—from *stadr,* a stead; *fastr,* fast]: firm; constant; firmly fixed or established; resolute; not fickle. STEAD'FASTLY, ad. *-lĭ.* STEAD'FASTNESS, n. *-nĕs,* firmness of mind or purpose; constancy; resolution.

STEADY, a. *stĕd'ĭ* [from STEAD: Dan. *stadig,* steady]: not tottering or shaking; constant in mind or purpose; not fickle or changeable; regular; not fluctuating; uniform; of good conduct; V. to keep from tottering or falling; to make firm or steady; to support, to become steady. STEAD'YING, imp. *-ĭ-ĭng.* STEAD'IED, pp. *-ĭd.* STEAD'ILY, ad. *-ĭ-lĭ.* STEAD'INESS, n. *-nĕs,* state of being not easily moved or shaken; firmness of mind or purpose; constancy.—SYN. of 'steadiness': resolution; immutability; unchangeableness; constancy;—of 'steady, a.'; regular; undeviating; invariable; uniform; fixed; unremitting; stable; constant.

STEAK, n. *stāk* [Icel. *steikja;* Dan. *stege,* to roast, to fry: Icel. *steik,* a steak: Sw. *stek,* roast-meat]: a slice of beef, venison, etc., to fry or broil.

STEAL, v. *stēl* [Dut. *stelen;* Dan. *stiœle;* Goth. *stilan;* Icel. *stela,* to steal]: to take or carry away the property of another unlawfully; to take by theft; to practice theft; to pilfer (see LARCENY): to gain or win by gradual and imperceptible means; to slip away unperceived; to convey away or withdraw without notice. STEAL'ING, imp. STOLE, pt. *stōl,* did steal. STOLEN, pp. *stōl'n:* ADJ. carried away unlawfully and secretly. STEAL'ER, n. *-er,* one who steals; a thief. STEALTH, n. *stĕlth,* secret act; secret means employed to accomplish an object; a way not perceived; in *OE.,* the act of stealing. STEALTH'Y, a. *-ĭ,* done by stealth; unperceived. STEALTH'ILY, *ad. -ĭ-lĭ.* STEALTH'FUL, a. *-fŭl,* given to stealth. TO STEAL A MARCH, to gain an advantage unobserved. TO STEAL HEARTS, to win or withdraw them from attachment or allegiance to others by various means. BY STEALTH, by secret act; clandestinely; with desire of concealment—often in a good sense.—SYN. of 'steal': to thieve; pilfer; plunder; rob; filch; purloin.

STEAM, n. *stēm* [AS. *steám*, vapor, smoke: Dut. *stoom*, vapor, steam]: the vapor of water produced by heating it to the boiling-point; the vapor of water employed as a motive power (see below): vapor in general: V. to apply steam to; to expose to steam; to give off vapor; to exhale; to evaporate; to progress, as a vessel by steam. STEAM'ING, imp.: ADJ. giving forth steam; being propelled by steam; rising in the form of steam. STEAMED, pp. *stēmd:* ADJ. exposed to steam; cooked or dressed by steam. STEAM'ER, n. *-ér*, ship or boat propelled by steam; in *cooking*, a vessel used to steam articles. STEAMBOAT, STEAM-PACKET, STEAMSHIP, STEAM-TUG, STEAM-VESSEL, ships propelled by means of steam. STEAM-HAMMER, STEAM-PLOW, STEAM-PRESS, STEAM-PUMP, etc., implements or machines worked by steam. STEAM-BOILER, vessel for containing water to be generated into steam (see STEAM, below: STEAM-ENGINE). STEAM-WHISTLE, whistle attached to a steam-engine and sounded by steam.

STEAM: one of the three normal forms, solid, liquid, and gaseous, in which water exists: see GAS: WATER. There is a fourth state, Vapor (q.v.), which has some of the properties of both the gaseous and liquid forms, but which is properly steam condensed into fine globules which have not had time to coalesce and form a continuous liquid. Steam, or the gaseous form of water, is invisible: when it becomes visible it is by reason of the return of at least a part of it to the liquid form, in which it exists in a finely divided state.

So long as the surrounding air is not saturated with vapor at a maximum density corresponding to the temperature, steam is given off from water, snow, or ice at all temperatures at which we know them, its density and tension lessening as the temperature lowers. Thus, water at 32° Fahr. can give off vapor at a pressure of 0·085 lbs. per sq. inch into air that does not already contain watery vapor of that tension, when of course the two tensions will be balanced, and there will be no evaporation. Great density or tension of the air does not prevent or even lessen evaporation from water, snow, or ice. But the presence of watery vapor at the maximum density or tension that the water can give off at the existing temperature will prevent it, no matter how low the density or tension of the atmosphere. The very fact that a vapor near the point of liquefaction has the power of retaining suspended in it a portion of its liquid in the state of cloud or mist, makes it difficult to determine just how much of the water or other fluid within a given volume is liquid, and how much gas or vapor.

Perfectly gaseous steam is composed of one cubic ft. of hydrogen and one-half cubic ft. of oxygen, collapsed into one cubic ft. of steam. Then, the ideal weight of one cubic ft. of steam, if supposed existing at 32° Fahr. under one atmosphere pressure, would be found thus:

1 cubic ft. of hydrogen. - - -	0·005592 lbs.
One-half cubic ft. of oxygen -	0·044628 "
1 cubic ft. of ideal steam, - -	0·050220 "

This would give for the volume of one lb. of steam at atmospheric pressure at 32° Fahr., could it exist, 19·913 cubic ft. The work that would be in it at that volume would be 19·913 X 2,116·3 = 42,141 foot-pounds. At one atmosphere of pressure and a temperature of 212° Fahr., the volume would be 27·18 cubic ft., and the work 57,522 foot-pounds. The foregoing ideal figures are deduced from chemical composition, and assume a perfectly gaseous condition. As ordinarily computed, the volume of ideal steam at 32° and one atmosphere pressure is only 19·699 cubic ft. per lb., the weight of one cubic ft. being 0·05076 lbs., and the work that is in one lb. 56,907 foot-pounds. At pressures of one atmosphere and upward, the actual density of steam exceeds that above noted, on the assumption of a perfectly gaseous condition, the gases increasing with the pressure. The tables generally used give for a pressure of one atmosphere and a temperature of 212° Fahr. 26·36 cubic ft. per lb.; a weight of 0·03797 lbs. per cubic ft.; and work to the amount of 55,785 foot-pounds in one lb. weight of steam.

In the liquid state, water, like other substances, has such a condition of each internal particle that it tends to keep its volume constant; to resist change of volume, but not to resist change of figure. This latter peculiarity, the non-resistance to change of figure in liquid, is shared with gases; but in the fact that gases tend to increase their volume indefinitely, they are diametrically opposed.

Increase of temperature increases the resistance of a liquid to compression, and diminishes its cohesion: see HEAT. For water, like most (if not all) liquids, there is for each temperature a maximum pressure on its external surface, which is necessary to keep it liquid. Addition of heat to its mass causes it to emit bubbles of vapor from its external surface. Water, like all liquids, under all circumstances, is believed to emit vapor from its surface, and to be surrounded with an atmosphere of its own vapor. When water or any other substance is in a vaporous condition, it is properly at the maximum density consistent with that condition.

The pressure of steam, or any other vapor, increases with the temperature at a rate which itself increases rapidly with the temperature. The pressure against the interior surface of a vessel by a given quantity of perfect gas within it, is the sum of all the pressures which any number of parts into which it might be divided would exert separately, if that part were in the same vessel alone and at the same temperature; and this same law is applicable to mixtures of gases; so that if 0·03797 lb. of steam at 212° Fahr. in a vessel having a volume of one cubic ft. exerts a pressure of one atmosphere, and if 0·080728 lb. of air in a volume of one cubic

it. at a temperature of 212° Fahr. exerts a pressure or 1·365 atmospheres, a mixture of the two will exert a pressure of 2·365 atmospheres.

Boiling, or the giving out of vapor bubbles from the surface of a liquid, is caused by the continuous communication of heat to the liquid mass, and the continuous removal of the vapor so as to keep the pressure of the liquid through its mass at a point not greater than that of saturation for its temperature. When the term boiling-point is used, it means the boiling-point under the average atmospheric pressure of 14·7 lbs. per sq. inch.

The presence of a dissolved substance, e.g., salt, in water, resists its tendency to boiling and raises its boiling-point under a given pressure; but if the dissolved salt or other substance does not evaporate with the water, it will cause no change in the relation between the temperature and the pressure of saturation of the vapor. Average sea water contains about $\frac{1}{32}$ of its weight of salt, and every successive $\frac{1}{32}$ that water contains raises the boiling-point about 1·2° Fahr. Water saturated with brine boils at 226° Fahr.

Vapor of a temperature above the boiling-point corresponding to its pressure, is brought into the condition of a permanent gas, and is said to be superheated.

In passing from the liquid state into steam, the temperature of water remains at the boiling-point, which is determined by the pressure of the vapor produced. To make the evaporation continuous, a certain quantity of heat must be added to the water or to the steam for each unit of weight of steam formed. That heat does not raise the temperature of the water nor of the steam, but disappears, being used in keeping the water in the gaseous state; and the amount so used without being perceived as heat, is called the *latent heat of evaporation*: see HEAT. Conversely, while steam, or any other gaseous substance or vapor, passes into the liquid state, its temperature remains stationary at the boiling-point (or condensing point, which is the same thing) corresponding to its pressure; and a quantity of heat equal to the latent heat of evaporation at that temperature is produced in it. In order that condensation may continue, the heat must be transferred from the water (or other liquid) to some other body.

The boiling of water or other liquid will be retarded by its being in a vessel which is of a material which attracts the liquid. This will cause the boiling to take place by starts instead of regularly.

The latent heat of evaporation of one lb. of water is, according to Regnault, 966·1 British units when the pressure is one atmosphere of 14·7 lbs. per sq. inch. The total heat of evaporation of water is the amount required to evaporate one lb. at a given temperature (the latent heat of evaporation), plus the amount required to raise it from some given temperature to that of evaporation (the sensible heat). The total heat of

steam from the temperature of melting ice has been proved by Regnault to increase at a uniform rate as the evaporation temperature rises.

If a certain volume of steam be in a closed vessel, and kept at constant temperature, and the pressure on it be increased by mechanical means, the increase of pressure will liquefy part of it, leaving the remainder at the same temperature as before. In this it widely differs from air, which, subjected to the same treatment, will have the density of all parts of it equally increased. We ordinarily apply the term steam to that vapor which rises from water heated to 212° in an open vessel; but there is no essential difference between steam at 212° and steam at 60°, except in the amount of heat that they contain. It may be asked, what becomes of the heat that is made latent in the evaporation of water? It may be said to be used in forcing apart the molecules of water or steam. It cannot be manifested both as heat and as work. If the steam does further work in driving a piston in a cylinder, it loses some of its heat, and its particles cannot be maintained at the same distance apart or at the same tension. In every investigation concerning steam, and in almost every calculation relating thereto, it is well to remember that all pressures should be counted from an absolute zero, or from that of a perfect vacuum, and such as would exist if the space were not filled with atmospheric air; and that this zero point is about 14·7 lbs. per sq. inch below the pressure of the atmospheric pressure; or, to put it more properly, the zero being a fixed point and the atmospheric pressure being variable with the height above the sea-level and with meteorological conditions, the atmospheric pressure is about 14·7 lbs. per sq. inch above absolute zero. That steam which is liberated from the surface of water in an open vessel at the sea-level has really a pressure of 14·7 lbs. per sq. inch, because it is just able to balance the tension of the atmosphere; but in ordinary gauges it is said to be of no pressure at all, because for purposes of work it has none available to drive a piston or otherwise do mechanical work. Steam produced in a confined volume in a closed vessel will have a tension of more than 14·7 lbs. per sq. inch above absolute zero of pressure, the pressure being nearly inversely as the volume. That is, a cubic inch of water made into steam in the open air at the sea-level will take up about 1,645 cubic inches, or nearly a cubic ft. That which is made from one cubic inch of water in a closed vessel having a capacity of 1,646 cubic inches, and containing, besides the cubic inch of water, 1,645 cubic inches of air at one atmosphere pressure, will have a pressure of about two atmospheres, which will be 14·7 lbs. per sq. inch above atmosphere ('by the gauge'), or 29·4 lbs. absolute. This nearly inverse relation between the pressure and the volume of steam is very nearly the same for all pressures and volumes, particularly for those within the range within which we know and use steam;

and enables us quite readily to compute the pressure of steam which is expanding in a cylinder, after being cut off from communication with the boiler: see EXPANSION: STEAM-ENGINE.

When water is boiled in an open vessel and has exerted against it no pressure except that of the atmosphere (14·7 lbs. per sq. inch), its temperature can never rise above 212° Fahr.; nor can that of the steam produced from it. Increase of heat simply increases the quantity of water evaporated, or the rate of evaporation. But if the evaporation be conducted in a closed vessel, the temperature of both the water and the steam can be increased to any degree. If such evaporation were conducted in a vertical cylinder having a piston fitting steam-tight, it would be found that increase of temperature would increase the tension of the steam so that it would raise the piston; and in order to hold down the latter there would have to be applied a weight or pressure. At that point where the weight or pressure applied to hold down the piston was 14·7 lbs. per sq. inch of its area (including the weight of the piston itself), and at which point the steam would have a pressure of 14·7 lbs. per sq. inch by the guage, or 29·4 lbs. absolute, it would be found that both the water and the steam in the cylinder had a temperature of about 250° Fahr. When by reason of continued application of heat the force required to hold down the piston becomes 29·4 lbs. per sq. inch of its area, at which the steam would have a pressure of 44·1 lbs. absolute, the temperature of water and steam would be about 273° Fahr. If instead of continuing to weight the piston until there was 29·4 lbs. per sq. inch on it, it had been allowed to rise with the increasing pressure, the continuous application of heat would only have caused the evaporation of an increased amount of water at a temperature of 250° and a pressure of 14·7 lbs. by the gauge, or 29·4 lbs. absolute.

At a temperature of 300° Fahr. the pressure of the steam should be 67 lbs. absolute; at 350°, 136 lbs.; at 400°, about 250 lbs. This increase in the ratio between the pressure and the temperature increases, so that we find that doubling the temperature increases the pressure nearly 23 times. This fact shows two things: first, that it is dangerous to continue to apply heat to a boiler or other vessel containing water, without allowing full escape for the steam; secondly, that, other things being equal, it is economical to use steam at high pressures rather than low, because the high pressures take comparatively less heat.

These facts concerning the temperature and pressure of steam refer to it only as long as it is in contact with water. The addition of heat while it is in contact with water causes additional steam generation without any rise in temperature. But steam heated away from contact with water may have its temperature raised without increase in pressure.

Steam generated in contact with water, but contain-

ing no water mechanically mixed therewith, is said to be saturated; its temperature being only that due to its pressure. That which is heated away from contact with water, and which has its temperature raised above that corresponding to its pressure, is said to be superheated. That which is used for purposes of power generation is very seldom superheated. Saturated steam, which is that used for almost every purpose in the industrial arts, differs greatly from a perfect gas in the relation between its pressure and volume. If the pressure be given in lbs. per sq. inch, and the volume in cubic ft., the product of the two, that is, the foot-pounds of work that are in it, will be expressed by the formula,

$$\log. pv. = 4{\cdot}675 + {\cdot}061 \log. p.,$$

i.e., the logarithm of the number of foot-pounds in any given quantity will be equal to 4·675 plus ·061 times the logarithm of the pressure.—See STEAM-ENGINE.

STEAM-CARRIAGE: vehicle propelled on a common road by steam. The first to suggest the application of the power of steam to propulsion of a land vehicle seems to have been Isaac Newton, who 1680 sketched the scientific toy described in explanation of the Newtonian philosophy. It is on the same plan as Hero's Æolipile, there being a spherical boiler (in this case mounted on wheels) with a jet which projects to the rear and is controlled by a handle managed by the driver. The reaction is supposed to drive the carriage ahead. In 1759 Dr. Robison proposed to Watt to apply steam to propulsion of a road vehicle. In 1765 Erasmus Darwin urged Boulton, then Watt's partner, and at that time corresponding with Franklin concerning steam power, to build a 'Fiery Chariot,' the plan of which he sketched. In 1790 Nathan Read planned and patented a S.-C., of which he made a model, and in which the axles were turned by ratchets on the piston rods; and the exhaust pipes were turned backward to utilize the back pressure in propelling the carriage forward. In 1769 Cugnot built and ran a S.-C.; and 1770 another with a single driving-wheel in front of a strong timber frame, and two stout trailing wheels. Two vertical engines of 13-inch bore, supplied by an insufficient boiler in front of the driving-wheel, turned the axles by a ratchet and pulley arrangement, which could be reversed to run the carriage backward.

The early history of the S.-C. is largely interwoven with that of the locomotive. Watt, 1784, proposed to apply his own engine to locomotion; this requiring either a non-condensing engine or an air surface condenser. In 1786 an American inventor, Oliver Evans (q.v.) applied for a patent to use the steam-engine for vehicles, but was refused by the Pennsylvania legislature. In 1800 or 1801, he commenced applying the non-condensing engine to a S.-C., but changed his plans, and turned his attention to mill driving by steam power.

Later he reverted to the idea of steam locomotion, and wrote: 'I have no doubt that my engine will propel boats against the current of the Mississippi, and wagons on turnpike roads, with great profit. . . . The time will come when people will travel in stages moved by steam-engines from one city to another, almost as fast as birds can fly, 15 or 20 miles an hour. . . . A carriage will start from Washington in the morning, and passengers will breakfast at Baltimore, dine at Philadelphia, and sup in New York the same day. . . . Engines will drive boats 10 or 12 miles an hour, and there will be hundreds of steamers running on the Mississippi, as predicted years ago.' In 1804 he built a dredging-machine which weighed about 40,000 lbs., and which consisted of a flat-bottomed scow, having a stern paddle-wheel, and mounted on four wheels so that it could be run on land—the first steam locomotive in America. It was propelled about the streets of Philadelphia by its own engines, launched in the Schuylkill river, and propelled down that stream into the Delaware.

In England there were many experiments in this line. Trevithick, 1802, made a model S.-C. (now in the Patent Museum at South Kensington) with a high-pressure non-condensing single-cylinder engine, whose piston drove a crosstail working in guides, and connected with a crosshead on the opposite side of the shaft by two side rods; being in fact the first 'return connecting-rod' engine. It was geared to the axles of the carriage; and the wheels were to be kept from slipping by driving bolts through their rims into the ground.—In 1821 James Griffiths patented, and Joseph Bramah built, a road locomotive having a large double coach-body between its two axles, and its machinery over and back of the rear axle. The boiler had horizontal water tubes and steam tubes, and the wheels were driven through gearing by two steam-engines suspended on springs. There was an air surface condenser, and the water of condensation was returned to the boiler, which latter, however, was not large enough.—In 1804 David Gordon re-patented Burnton's idea of 1792, which also had been preceded by Gurney, and occasionally appears now as a new invention—the use of jointed legs to imitate the action of the legs and feet of horses. Other inventors made various experiments.

In 1827 Gurney built a S.-C. which ran regularly in the neighborhood of London for two years, on one occasion going 85 m. in 10 hours. This carriage had the mechanical legs and feet, which he afterward abandoned. In 1828 he produced one with a sectional boiler in the rear, and two horizontal reversible, link-motion engines, cutting off at half stroke, a little in advance of the centre. There was a blast apparatus driven by a separate engine. The feed water was heated, and the steam superheated.—In 1827 Hancock made steam carriages having 'sheet flue' boilers, and three wheels, the leading one swivelling on the king bolt; the motive power being two

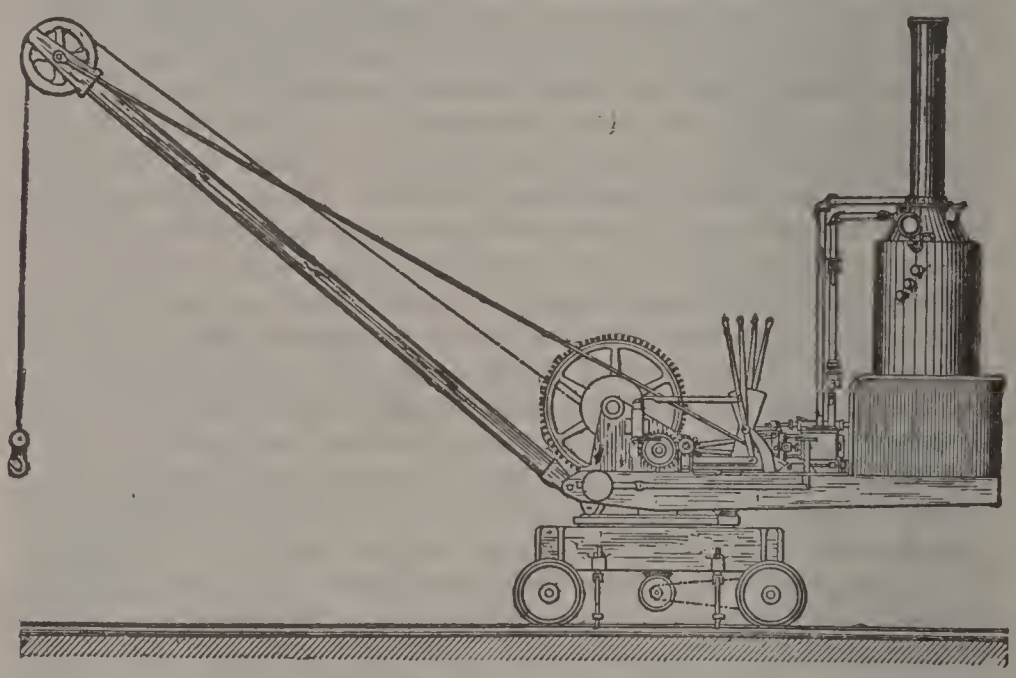
oscillating cylinders connecting with a cranked axle In 1831 he ran a S.-C. regularly for hire between London and Stratford; and in the same year Dana ran one between Cheltenham and Gloucester, 9 m.; making the trip in 45 to 55 minutes; and carrying 3,000 passengers, and running 3,500 m. between Feb. 21 and June 22. Ogle & Summers, about this time, are reported to have run one at high speed, with 250 lbs. of steam. In 1833 Macerone ran a steam-carriage of his own design from London to Windsor and back, with 11 passengers, 23½ m. in two hours. In the same year Dana ran his carriage 16 m. an hour; making long excursions at the rate of 9 m.; and Heaton towed a coach and 20 passengers up Lickey Hill between Worcester and Birmingham, on one of the worst roads in the country, up a gradient of one in eight to one in nine.

Hancock's steam coach 'Infant,' built 1831, was in 1832 plying between London 'City' and Paddington His 'Era' was a success mechanically, though the company for which it was built was not commercially. The 'Infant' ran, 1832, Oct., from London to Brighton, with 11 passengers, 9 m. per hour; ascending Redhill at the rate of 5 m. His 'Autopsy' of 1833, ran from London to Brighton, and all about the crowded streets of London; then regularly between Finsbury Square and Pentonbury. This had both the engines and the boiler vertical—the latter in the rear, and having a forced draught from a blower, the former rather to the rear of the centre, and driving the rear axles by chain gearing.—In 1834 Hancock built for an Austrian company a steam 'drag,' which carried 10 passengers, and towed a coach with six more, making 14 m. an hour on the level and 8 on rising ground. In 1835 his 'Erin' was built, to carry 20 passengers. It towed three omnibuses and a stage-coach, with 50 passengers, on a level road, 10 m. an hour; and towed an omnibus with 18 passengers 14 m. an hour. Later it ran 75 m. to Marlborough, in 7½ hours running time, stopping 4½ hours on the road by reason of having left its tender and supplies. From 1836, May, he ran his carriages regularly on the Paddington Road five months, making 712 trips, in all 4,200 m.—the daily run being about 5¼ hours. In 1838 he built for his own use a light steam phaeton, which made 20 m. an hour when desired. In all he built nine steam carriages, which could carry a total of 116 passengers besides their attendants.—1833, Dec., there were 20 steam-carriages and traction road-engines running or under construction in and about London; but the determined opposition of the stage-coach interest largely caused their commercial defeat.

In the United States, the condition of the ordinary roads and streets in the first half of the 19th c., and till the present day, has prevented successful experiments; and the development of railways has precluded the attempt to use road-engines for traffic between towns.—See TRACTION-ENGINE.

STEAM-CRANE: machine for raising and lowering weights, and for moving them horizontally, in either a rotary or a rectilinear direction—the power being given by a steam-engine attached to the crane itself, whether the steam be generated in a boiler attached, or be carried to the crane by pipes from a fixed source.

Of the rotary type there may be these varieties: swing, which have rotation, but no travel to and from the vertical center of motion; jib, which have rotation or swinging motion and in addition a trolley by which the load may be moved in and out from the centre; column, practically the same type as a jib, except that the centre is a fixed column, which may support a floor above; pillar, having rotation only, and the head of the pillar of which is unsupported; walking—that is, of the pillar or jib type, but mounted on wheels and travelling on a truck; locomotive, or of the pillar type, but mounted on a truck and having a steam-engine and boiler for hoisting and lowering the load, and swinging it, and for propelling the machine as a whole.



Steam-crane.

Of rectilinear cranes there are: bridge, which have a fixed bridge spanning an opening, and a trolley which supports the load and moves along the bridge; tram, formed of a short bridge moving lengthwise on overhead rails and having no trolley motion; travelling, consisting of a bridge moving lengthwise on overhead tracks and having a trolley moving along the bridge; gantries, which consist of an overhead bridge carried at each end by a trestle which travels upon a track on the ground—the bridge having a trolley; rotary-bridge, having both swing and lengthwise motion, and consisting of a bridge pivoted at one end to a central pier and supported at the other on a circular track —the bridge having a trolley moving crosswise thereon.—The locomotive and gantry types are necessarily steam-cranes; the others may be worked by other power.

as by hand, hydraulic pressure, compressed air, or electricity.

Locomotive cranes are really of more general use than any of the other types, as they can pick up and swing a load as an ordinary jib crane can, and at the same time walk and travel therewith on the length of track available. By slight and inexpensive alterations they may be used temporarily as fixed or docked cranes, as steam hoisting-engines, and winding-engines, for pile-driving, and for train service. The cut shows a locomotive crane which hoists rotates, and travels by steam: as shown, there are anchoring or gripping clamps from the car or platform to the rolls, for use when hoisting heavy loads.

STEAM-ENGINE: a machine utilizing the steam from a boiler, so that it is made to do work by its pressure. See HEAT: STEAM: CALORIC ENGINE: BOILER: WORK. In very early days, nearly 200 years ago, they were more properly called fire-engines, thus recognizing that the steam is but a medium by which the work that is in the heat is carried and applied in convenient form. The first steam-engines (or fire-engines, as they were then called) used steam only at atmospheric pressure, to do the mechanical work of forcing the atmosphere from a vessel, in which a spray of water then condensed the steam back into water. The atmosphere pressing upon the surface of a body of water caused the latter to refill the vessel, or acting upon a piston caused it to descend, doing work by hauling on one end of a beam, the other end of which caused the working stroke of a deep mine-pump. The measure of the gross work done, including friction, was the difference between the atmospheric pressure of 14.7 lbs. per sq. inch, and the pressure remaining in the working vessel, due to the temperature therein. Such devices were called atmospheric engines.

Long prior to this (B.C. 130) was Hero's Æolipile (see HERO), a globe mounted on hollow trunnions through which steam passed, and having, 90° from these, two radial tubes furnished with jets at right angles to themselves and the trunnions, this globe being made to rotate by the reaction of the steam against the atmosphere Although it may have been made to do light work r attaching a driving-pulley to one of the trunnions, i remained practically a scientific toy.

Though the invention of steam as a motive power is claimed by various nations, its first extensive employment, and most of the improvements of the steam-engine, the world owes to the English and the Americans. As early as 1543, a Spanish capt., Blasco de Garay, showed in Barcelona harbor a steamboat of his invention, probably on the principle of the Æolipile of Hero. The German engineer De Caus describes, in *Les Raisons des Forces Mouvantes avec Diverses Machines* (Frankf. 1615), a steam-machine for forcing the water contained in a copper ball through a tube, by applying heat. An Italian engineer, Branca, invented, 1629, a steam-wheel; the steam

being generated in a boiler, and directed by a spout against flat vanes, thus setting the wheel in motion.

In England one of the first notices of the idea of employing steam as a propelling force is in a small volume, *The Art of Gunnery* (1697), by Nat. Nye, mathematician; in which he proposes to apply it in discharging ordnance. But the first successful effort was that of the Marquis of Worcester. In his *Century of Inventions*, the manuscript of which dates from 1655, he describes a steam-apparatus by which he raised water 40 ft.: this, under the name 'Fire-waterwork,' appears to have been in use at Vauxhall in 1656. Sir Samuel Morland, 1683, submitted to Louis XIV. a project for raising water by steam, accompanying it with ingenious calculations and tables. The first patent for applying steam-power to various kinds of machines was taken out in 1698 by Capt. Savery. In 1699 he exhibited before the Royal Soc. a working model. His engines were the first used to any extent: they seem to have been employed for some years in mine drainage in Cornwall and Devonshire. Their essential improvement over the older ones was the use of a boiler separate from the vessel in which the steam did its work.

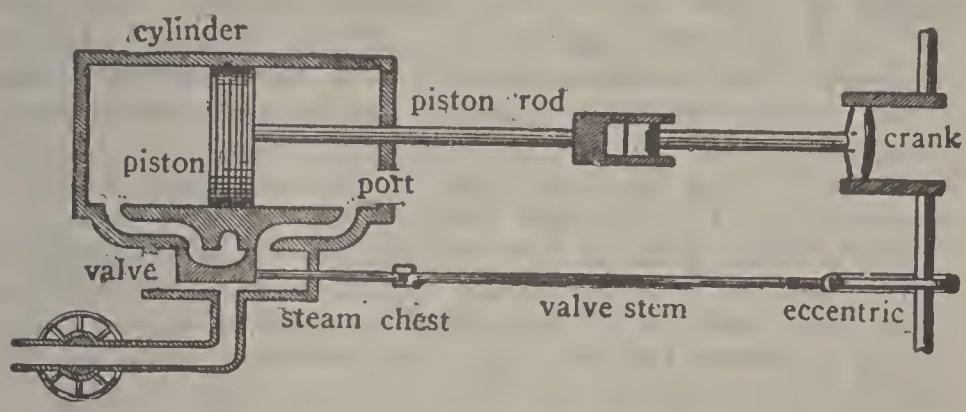
The first so-called 'fire-engines' (of Capt. Thomas Savery, 1698—see his *Life*) were pistonless water-elevating machines much similar in principle to the 'pulsometer' of the present day, operating no machinery. Steam (at a low pressure) entered an egg-shaped chamber full of water, part of which it drove out, becoming itself condensed, thus forming a vacuum which was filled by the inrush of more water from the source of supply, which in turn was driven out by a fresh volume of steam. Suitable check-valves controlled the inlet or outlet of the water, and the steam admission was controlled by an ordinary cock.

In all attempts at pumping-engines before 1690, including Savery's, the steam acted directly on the water to be moved. To Dr. Papin (q.v.), a Frenchman, is due the idea of the *piston*, 1690.

The atmospheric engine (Newcomen, Savery, and Cawley, about 1705) was a great step in advance: it was largely applied in mines, holding its place for nearly 70 years. It was a single-acting pumping-engine with a piston which drove no rotating piece, but confined its work to raising a heavy piston-rod; gravity causing the return stroke. The condensation by which the atmospheric pressure (see ATMOSPHERE) was enabled to exert its downward pressure upon the piston was effected in the working cylinder itself, which naturally remained too cold for proper steam admission permitting piston elevation, yet too warm for rapid and thorough condensation. Making the condenser a separate vessel in connection with the lower end of the working or piston cylinder permitted great advance: see WATT, JAMES. A further step was making the cylinder double-acting, thus doubling its capacity, and properly permitting the application of the machine to turning machinery instead of only to raising a pump rod. The use

of an air-pump to withdraw from the condenser both the condensed steam and the mixed steam and air, and surrounding the cylinder with a steam-jacket or with a non-conducting lagging (see HEAT: NON-CONDUCTOR), were improvements by James Watt (q.v.), with which began (1769) a new era in the history of the steam-engine. The principal improvements since his day have been in enlarged applications of his principles, and in the multitudinous details of construction.

In operation the steam is admitted from the boiler to the steam-chest. It passes by the slide valve and enters the port on the right, pushing the piston to the left. When the piston has reached the left end of the cylinder, the expanded steam escapes by the port at that end, passing through the cup-like opening in the slide valve, to the exhaust, which is in the rear. After this, the slide valve is moved by the valve-stem and the eccentric, and the steam is allowed to enter by the left port, reversing the movement of the piston. Thus the piston moves back



Working Parts of a Simple Steam Engine.

and forth, that is reciprocates, and drives the crank, turning the main shaft of the engine.

The general principle of the modern steam-engine will perhaps be better understood from theoretical engines, beginning with the most simple, and gradually adding features which have proved important.

The first which we may imagine has but one cylinder, which we will suppose to be vertical and closed at only one end, to have a bore of 100 sq. inches area, fitted steam-tight with a freely-moving piston, and to be supplied with one simple cock to admit steam from a boiler, say of 40 lbs. pressure by the gauge, and another cock to permit it to exhaust into the open air. In pressing up the piston with an effective force equal to 40 lbs. per sq. inch by the ordinary gauge, or, disregarding fractions, of $40 \times 100 =$ 4,000 lbs., this steam has really a pressure of 54.7 lbs. per sq. inch; but it must overcome the atmospheric pressure of 14.7 lbs., per sq. inch either in blowing off from the safety-valve or in driving a piston; so the gauge is graduated to show its net pressure, or pressure above atmosphere. If the exhaust-valve is opened to permit the weight of the piston to bring it to its original position,

this single-acting, single-cylinder engine will have made but one working stroke. If the piston have a stroke of one ft. the gross work done in driving it to the end of its stroke will be 4,000 foot-pounds. If the stroke take a minute to accomplish, the engine will have a power of $\frac{4}{33}$ horse. If it makes 33 such strokes in four minutes, it will have one horse-power (see BOILER), because it will be doing 132,000 foot-pounds of work in four minutes, or 33,000 in one minute.*

The amount of steam used would be a whole cylinderful of 1,200 cubic inches, at a pressure of 40 lbs. per sq. inch by the gauge, or 54.7 lbs. above zero. If, instead of permitting steam to enter during the entire stroke, the admission-valve was closed at half-stroke, there would be used a half-cylinderful or 600 cubic inches during that stroke; the steam would tend to expand, decreasing in pressure about in the same proportion as it increased in volume, until it had forced the piston to the end of the cylinder, where the half-cylinderful, or 600 cubic inches at a pressure of 54.7 lbs. would have a bulk of one cylinderful or 1,200 cubic inches, whose pressure would be $54.7 \div 2 = 27.35$ lbs. per sq. inch above vacuum. If the eduction-valve (exhaust-valve) were then opened, this steam would escape or exhaust against the atmospheric pressure of 14.7 pounds per sq. inch. The work that it had done during the time when it had full boiler-pressure would be $4{,}000 \times \frac{1}{2} = 2{,}000$ foot-pounds.

The average pressure of 21.02 lbs. per sq. inch upon the piston area of 100 sq. inches would exert a pressure of 2,102 lbs. and, as it propelled the piston one-half ft., would represent 1,056 foot-pounds, the work done by the half-cylinderful of steam during expansion. Added to the 2,000 foot-pounds done before cut-off, it gives 3,056 foot-pounds of work done by a half-cylinderful of steam, with cut-off at one-half. In theory we have a gain of $\frac{3056-2000}{2000} = \frac{1065}{2000}$, or 52.8 per cent. by cut-off at one-half stroke. Cutting off at quarter stroke instead of at one-half, we have the work done during the period of full steam $40 \times 100 \times 0.25 = 1{,}000$ foot-pounds; that done during expansion is $8.45 \times 100 \times 0.75 = 634$ foot-pounds; total work done during the full stroke 1,634 foot-pounds, with cut-off at $\frac{1}{4}$: that is, with a quarter-cylinderful of steam. As the work done by a quarter-cylinderful of steam without expansion would be only 1,000 foot-pounds, we have an increase of 63.4 per cent. in the work done. In practice it is found that with a single cylinder expansion can seldom be profitably carried on through more than $\frac{4}{5}$ of the stroke (cutting off at $\frac{1}{5}$).

A further development of such an engine would be to make it double-acting, i.e., to let each end serve alternately for working pressure and for exhaust. As the pressure throughout the stroke of such an engine would

*In all these typical engines it is supposed that the steam does not lose either temperature or pressure by condensation, friction, or other cause, and that the engine is frictionless.

vary, increased steadiness would be gained by having two or more cylinders acting on cranks at equal distances about a shaft. A further development would be to enable the steam to exhaust into a vacuum instead of against the atmospheric pressure of 14.7 lbs. per sq. inch. This can be effected by condensing the exhaust by a spray of cold water, preferably in a closed vessel; forming what is known as a jet-condenser. If the condensation of the steam were perfect, there would be, to oppose the exhaust of the steam, only the tension due to the vapor from the water at the temperature of that water after it had cooled the exhaust steam and been heated and added to thereby. On the supposition of no tension, we have in the case of the same hypothetical engine, with no cut-off, a pressure of 54.7 lbs. per sq. inch on the piston, which would be 5,470 lbs. pressure on the piston; and working through 1 ft. each single stroke, we have 5,470 foot-pounds, instead of 4,000, as the maximum theoretical work done by one cylinderful of steam. In fact, by perfect condensation we add 1,470 foot-pounds to whatever work the engine does. Thus we have the following theoretical maximum gains by condensation for no cut-off, and for cut-offs at half-stroke and quarter-stroke respectively:

Period of expansion.	Work before expansion or condensation.	Work during expansion.	Total work before condensation.	Work during condensation.	Total work.	Gain by condensing.
Stroke.	ft. lbs.	ft. lbs.	ft. lbs.	ft. lbs.	ft. lbs.	
0	4,000	0	4,000	1,470	5,470	36.75
½	2,000	1,056	3,056	1,470	4,526	48.10
¾	1,000	634	1,634	1,470	3,104	89.9

The jet-condenser had the disadvantage of mingling the water of condensation with that which is to be fed with the boiler. This may be avoided by condensing the exhaust steam in contact with one side of metallic surfaces, as tubes, whose other side is in contact with a current of cold water. An apparatus on this principle is known as a surface condenser. It is most usual to pass the water through the tubes, and the steam into the case around them; though in the British navy the reverse is the usage, for the purpose of lessening the heating effect of the condenser on the engine-room. Where there is considerable flow of water, a very simple device, known as a siphon-condenser, is used: in it the exhaust steam and the condensing-water are in concentric jets, and the nozzles are of such shape as to give the greatest possible contact-surface between the two fluids.

In practice the principle of using steam expansively in a single cylinder cannot be carried much further than to cutting off at $\frac{1}{5}$, because of the difficulties (1) of cutting off so early with an ordinary slide-valve without choking the exhaust and opposing to the advancing piston a back pressure which would have to be subtracted from the pres-

sure on the working side; (2) of the cooling of the cylinder walls during expansion in one single stroke causing condensation of the incoming steam for the next single stroke, and (3) of using the same ports and passages for comparatively cold exhaust steam and hot new steam, which chills the latter—thus causing a loss of temperature and pressure, consequently of efficiency; (4) of the greatly varying pressures on the crank-pins during a complete stroke.

For this reason, just as it was found desirable to cause the condensation of the exhaust in a vessel separate from the working cylinder, it has been seen to be advantageous to have high grades of expansion conducted in a separate cylinder into which the exhaust of the first one is conducted, instead of into the atmosphere or into a condenser. The exhaust of this cylinder may be permitted to escape into the open air against the atmospheric pressure or led into a condenser where that pressure will be removed. To effect this work of expanding in two successive cylinders (or compounding, as it is called), the first or high-pressure cylinder has a smaller volume than the second or low-pressure cylinder; the ratio between the two being preferably such as will about divide between them the work done. In such a compound engine, the low-pressure cylinder (with its condenser, if there is one) is practically the measure of the work done by the entire engine, at a given degree of expansion, counting from the admission-pressure in the small or high-pressure cylinder to the terminal or exhaust pressure in the large or low-pressure cylinder. Its expansion in the high-pressure cylinder instead of in the low is merely a convenience to save shock on the mechanism, and to lessen the loss by cooling against the cylinder walls and in the cylinder passages.

Compounding may be effected by dividing the exhaust from one high-pressure cylinder between two low-pressure cylinders, or by exhausting from two high-pressure cylinders into one low; the effect of having more cylinders for a given degree of expansion in two stages being to equalize the strains and lessen the shocks on the machinery, while increasing the cost of the machinery and the amount of internal cylinder condensation.

A further development of compounding in two successive stages is what is known as triple expansion, in which there are three successive stages of expansion done in three or more cylinders. Usually there is one small or high-pressure cylinder, receivng steam direct from the boiler, and exhausting into an intermediate one of larger size, which in turn exhausts into a third or low-pressure cylinder of still larger volume. Either the first, the second or the third stage of expansion may be effected in more than one cylinder; the principle is the same. It is triple expansion if there are three stages effected in three cylinders or sets of cylinders. Triple expansion enables and requires higher initial pressure than compounding, in order to make it economical and desirable.

Carrying still further the same principle of separating

in successive cylinders, we have what is known as quadruple expansion. The greatest simplicity of construction to effect this calls for four cylinders of successively increasing capacities; but any of the stages may be conducted in either one or more cylinders. In quadruple expansion the cylinders receive the name of high-pressure, first and second intermediate, and low-pressure; and there may be one, two, or more of these, all in the same system. Quadruple or 'four-stage' expansion enables and requires higher initial pressure than triple expansion, and is only just now (1891) coming into understanding and use; engines of this type being, with a very few exceptions, confined to marine service.

The two-cylinder compound engine may have its cylinders set in line, both pistons attached to one rod and with simultaneous movement, the exhaust from the front or upper end of the small cylinder going directly to the back or lower end of the large, and that of the back or lower end of the small cylinder going to the front or upper end of the large; in which case but one crank will be needed, but the pressure on the crank-pin will be very varying and the motion very unsteady. They may be side by side, having two piston-rods united to a common crosshead, and requiring but one crank; the exhausts being in the same direction and order as in the first case named. This has nearly all the disadvantages of the first way, plus the additional objection of taking up more room. The cylinders may stand side by side, but with the exhaust from each end of the small cylinder going directly to the adjacent end of the large cylinder. In this case the pistons will travel not together, but in opposite direction; and two cranks will be needed. This will have the advantage of great steadiness of motion and less shock and strain on the parts. Instead of going directly from the small cylinder to the large one, the steam may be taken into a 'receiver' or intermediate reservoir, which will enable the small cylinder to get its steam at a more advantageous time than when there is no receiver; permitting more advantageous points of cut-off, exhaust, etc.; and allowing both the work and the strains to be more evenly divided between the cylinders or among the various divisions of the crank rotation.

It must be understood that either a single-cylinder expansive engine, a compound, a triple-expansion, or a quadruple-expansion engine may be either single-acting or double-acting, condensing or non-condensing; though it is rare that a compound engine of any size is used non-condensing.

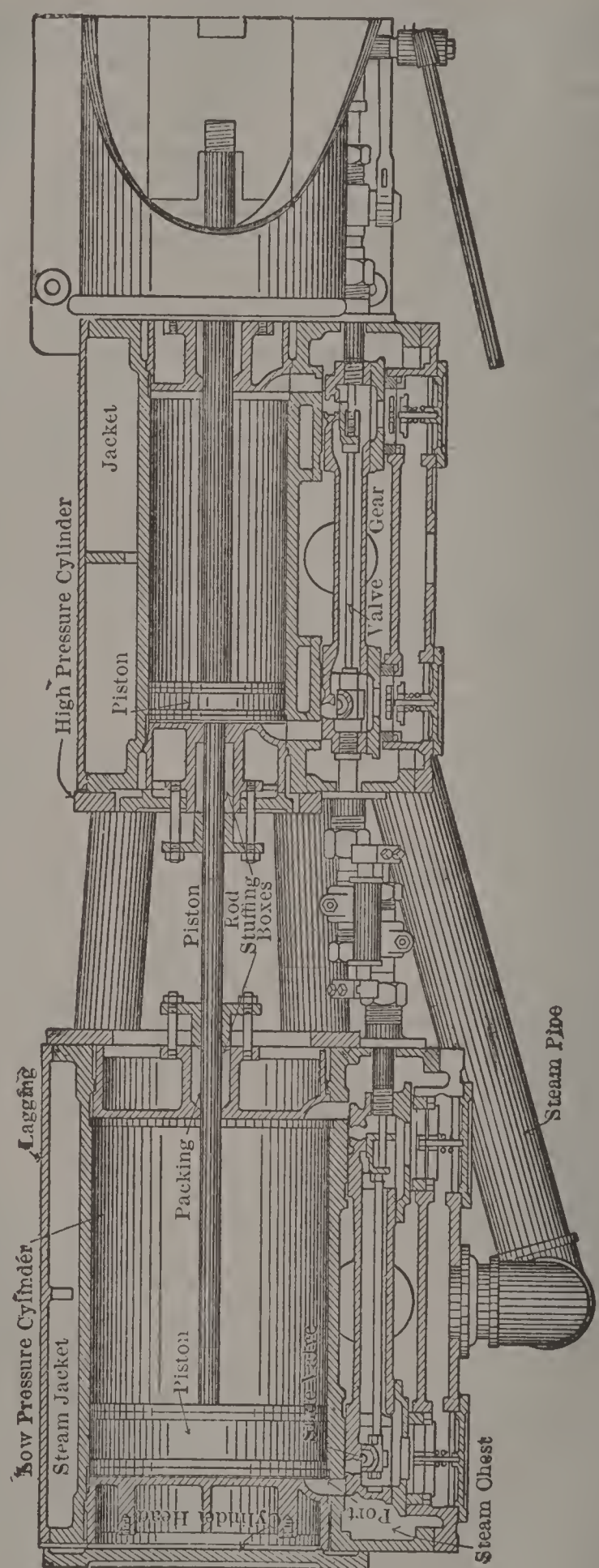
By reason of the varying amount of the piston pressure, and of the varying angle at which that pressure acts on the crank, particularly with early expansion, the motion of any single-cylinder reciprocating engine would be exceedingly unsteady; and there would be also liability of the engine being stopped when the piston-rod, the connecting rod, and the crank were in the same line, which occurs

at each end of each stroke—the corresponding crank positions being called the dead points. Having two or more cylinders each with its own crank, these cranks arranged at proper angles about the shaft, increases the steadiness of motion, and naturally precludes the risk of the engine stopping on the dead-centres; but there remains another source of irregularity of motion, due to the varying nature of most loads, and to the varying steam-pressure with which the cylinder is supplied by the boiler. Increase of load without increase of pressure, or decrease of pressure without change of load, would tend to make the engine slow down; while decrease of load without change of pressure, or increase of pressure without change of load, would tend to make it speed up. Still greater variations in speed would be caused by simultaneous increase of pressure with decrease of load, or increase of load and decrease of pressure. To prevent this, two attachments are made: the first, a heavy-rimmed wheel fixed to the shaft; the second, an automatic device for either lowering the initial steam pressure or cutting off earlier, on any tendency to increase speed; and increasing the initial steam-pressure of cutting-off later on any tendency to slow down. The first device is called a fly-wheel; the second a governor. The fly-wheel acts solely by its inertia. While the engine is getting up to its speed, the fly-wheel is absorbing power. Any sudden and momentary tendency of the engine to increase its speed is counteracted in great measure by the fly-wheel, which, if heavy enough and of sufficient diameter, absorbs nearly all the excess, paying it out gradually until the normal speed is again reached; thus making, of what might otherwise be a running away or racing, only a slight gradual increase of speed, followed by a gradual decrease to the normal amount, if the conditions remain normal. In the same way any sudden and momentary tendency of the engine to slow down would be met by the fly-wheel by a giving out of momentum; so that what might be a very considerable momentary slowing down, is changed to a very slight and gradual decrease of speed, followed (if the conditions are restored to their normal state) by gradual return to the normal speed. In other words, the fly-wheel acts as a storehouse of power: its inertia causes it to oppose any tendency either to slowing down or to speeding up. The greater the weight of fly-wheel rim for a given diameter and rotation-speed, the heavier the rim for a given diameter and rotation speed, and the faster the rotation-speed for a given rim-weight and diameter, the more efficient it is in keeping the rotation-speed uniform; so that where there are expected great variations of pressure or of load, or where great regularity is intended, it is necessary only to increase sufficiently either the rim-weight, the diameter, or the rotation-speed.

But it must be remembered that a fly-wheel can take care of only momentary variations in pressure or in load It only distributes through many rotations an excess A

power that would be inconvenient if used during a few; or stores up in attaining the regular rotation-speed, enough power to keep the engine going for a few turns at nearly the regular speed, in case of momentary increase of load or decrease of pressure; but it has no power to keep the engine steady during continued increase or decrease of pressure or of load. If the load were taken off and the pressure kept up, or the load kept the same and the pressure doubled, the engine would run away, and probably wreck itself, despite the fly-wheel; and *vice versâ*, if the load were doubled and the pressure not increased, or if the load remained the same and the pressure fell to one-half, the engine would slow down, fly-wheel or no fly-wheel. To take care of permanent or of long continued variations in either load or pressure, there is used an automatic governor, usually depending for its action on so-called centrifugal force. In the centrifugal governor, which exists in several modifications of two general types, a weight attached to an arm maintains a certain position with respect to its centre of rotation, as long as the speed remains at the normal rate; but tendency to increase of speed causes the weight to recede from the centre, and in so doing its arm is caused to alter either the amount of opening for steam, or the point at which it is cut off. If this centrifugal regulator or governor acts to lower the initial pressure by reason of an attempt at increase of speed, it is called a throttling-governor; if, as is the case on higher grade engines, it causes cut-off to take place earlier, it is called a cut-off governor. In either case the result is the same; the mean effective pressure on the piston is reduced. The tendency of the engine to go fast causes the governor to exert a retarding influence; and *vice versâ*. Usually the centrifugal governor over-regulates at first, so that a tendency of the engine to run, say five per cent. too fast, is met by the governor causing it to run say four per cent. too slow, then three per cent. too fast, next two per cent. too slow, then one per cent. too fast, and so on. The fly-wheel acts in harmony with it to prevent these dancing tendencies from being manifested except to the most delicate apparatus.

The points of cut-off may be fixed or variable. If fixed, the regulation can be only by varying the initial pressure If variable, a change may be effected (1) by hand, (2) by the governor. In both cases, the changes may be made while the engine is running. If the point of cut-off is variable, it may be either (1) by hand, or (2) automatic; in the first case, this may be (1) while the engine is at rest, or (2) while it is running. If the governor varies the point of cut-off while the engine is running, it may do it either (1) by never releasing control of the cut-off-varying valve, and doing the actual work of moving that valve, or (2) by indicating the point at which the cut-off valve shall be closed by a weight or a spring; the governor in this case practically only pulling the trigger of the cut-off mechanism. In the first case the cut-off is said to be positive; in the second, 'drop' or 'detent.'



Sectional Plan of Cylinders and Valve Gear, Tandem Compound Engines.

Valves.—The valves which effect the steam distribution, that is which let it in, cut it off and let it out, may be of three general types: slide, plug, or poppet. Slide-valves are properly those which have a lengthwise motion or its equivalent; controlling admission and eduction ports at right angles to the cylinder bore. They are of three classes: flat, rocking, and piston.

The most usual type of flat slide-valve is of D section, consisting practically of a block having a flat working side, in which there is a central cavity, and which slides over three parallel ports at right angles to its line of motion. Each of the outside or end ones of these three ports serves alternately as an induction and an eduction port; one serving each end of the cylinder. The central port serves only as an exhaust-passage, and acts in this capacity for each end of the cylinder in turn. The central cavity in the slide-valve places the central valve-seat port in connection with each of the end ports alternately: and the outside lips, legs, or blades of the block alternately open and close the end-ports for admission of steam from the chest or box in which the valve slides.

Substituting for the sliding block a portion of a cylinder, turning in a hollow seat ported in the same way as for a plain slide, giving this partial cylinder a similar cavity to that in the slide, constitutes a 'rock-valve.'

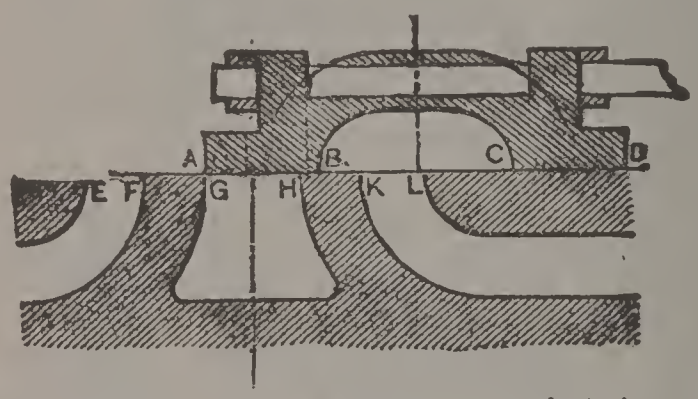
Instead of developing the slide-valve into a portion of a cylinder having its axis at right angles to that of the engine cylinder, we may wrap it around an axis parallel to that engine cylinder axis, and let it play in a shell similarly ported to the plain valve-seat, and we will have what is known as a piston-valve, having both inside and outside lap.

If the legs or lips of a slide-valve exactly coincide with the end-ports, with a trifle extra width to insure tightness, and the valve is at its mid-position when the piston is at stroke-end, a complete forward and backward half-stroke of the valve will coincide with a single piston stroke in one direction only; steam admission for one end of the cylinder and exhaust for the other taking place when the piston is at stroke-commencement, and continuing until stroke-end. If, however, the valve face is extended at each outside end beyond the outside edge of the end-ports (as shown in Section of Lapped Slide-valve), the valve will have to start with one of its outside edges in line with the outside edge of the end-port, at the time that the piston is at stroke-commencement; and in this case admission will be continued during only a part of the stroke, and cut-off will occur at such time as the returning valve covers the admission-port; the length of time during which full steam will be admitted depending on the length of valve-travel.

A valve having such excess of length of leg or blade over the distance between outside port-edges is called a lapped valve, the excess being called steam lap, or simply 'lap.' The addition of steam lap will affect the exhaust, because of the change in the relative times of the valve

and the piston being in their mid-positions. This change of time caused by lengthening the valve will cause it to open for exhaust before the advanced stroke is ended; and to close the exhaust before the return stroke is completed. The first is called pre-release; the second cushion or compression, because it causes the exhaust steam to be compressed in the cylinder-end between the piston and the valve-face. The shorter the valve-travel for a given addition or lap, the greater influence the lap will have in causing cushion to come earlier and pre-release later. If the valve has the inside edges of the legs or blades prolonged between the inside edges of the end-ports, so as to make its arch or cavity shorter than the distance between such inside edges (as in the annexed cut), the effect of this 'inside lap' or 'exhaust lap' will be to cause it to open for pre-release later in the advancing stroke, and to close the exhaust for cushion or compression earlier on the return stroke.

In order to give the steam a better chance to fill the cylinder quickly, particularly at high piston-speeds, it



Section of Lapped Slide-valve, causing steam admission at the left-hand end, and compression at the right.

is usual to set the valve and its driving mechanism so that it opens the end-ports for admission a minute portion of time before the piston has arrived at stroke-end and is ready to reverse. This advancement is called 'lead'.

The advantage of the slide-valve is that with one valve the functions of admission, cut-off, release and compression may be performed for both ends of the cylinder. Its principal disadvantage is that it ordinarily entails excessive waste-clearance in the passages, and that a change in the time of any one of these functions necessitates a change in all the other three; also that a change in any one of these at one end of the cylinder causes a change not only in the other three at that end, but in all four at the other end. To give greater flexibility in this respect, there are several ways. The ordinary slide-valve may be retained, to control the steam distribution at both ends of the cylinder; but it may be supplemented by a separate cut-off valve which controls the cut-off at both ends, and which may by very little increase of complication be made to permit variation of cut-off in one end independently of the other. Another way is to give each end of the

cylinder one valve which will effect admission, cut-off, release, and compression for that end. Another is to have one valve which shall control the admission and cut-off for both ends, and another valve which will control the release and compression for both ends. A further development is not only to have one opening for admission and one for eduction at each end, but to have each controlled by a separate valve; and in some cases there are not only two eduction and two admission valves, but on each admission-valve a separate cut-off valve, making six valves and four cylinder-openings.

When more than one valve is provided to effect the steam distribution, it is usual to leave the three slide-valve types, and to use either a plug-valve, which is approximately cylindrical, and lies across the cylinder axis; or a poppet, a disk supported upon a vertical stem, and closing on a circular seat. Nearly all the high-grade engines of the present day use valves of one of these two latter types.

The poppet-valve may be either single beat or double beat, according as it has one or two disks and takes steam on only one side or both above and below. In the latter case there is less unbalanced pressure and its action is more quiet.

Valve-gear.—Equally important with the valves which effect steam distribution are the mechanisms for producing the proper motions of those valves. These valve-gears, or valve-motions, as they are also called by engineers, vary according to the results which they are intended to produce, also with the circumstances under which they are to be worked. As regards the results which they are to produce, the first consideration is whether they are to cause all the functions of steam distribution with one valve or with two or more; and if with two or more, whether the same steam ports are to be used alternately for admission or exhaust, or there are separate admission and eduction passages and ports.

The original D slide-valve, causing the four functions of steam distribution with but one valve and using the same cylinder-ports alternately for admission and eduction, is the most common and the most simple; and permits of the most simple gears or mechanical movements to drive it. The simplest method for effecting its reciprocation is by a crank on the main shaft; a connecting-rod of this crank operating directly on the end of the valve-rod if the valve is on the side of the cylinder and in the same plane with the cylinder axis and the main shaft.

Instead of the crank there is generally employed an eccentric, which practically differs from the crank only in appearance, being in effect a crank-pin enlarged into a disk which includes the shaft that drives it. The strap surrounding this disk connects, by an eccentric rod which is readily attached to it, with the end of the valve-rod; and this rotation of the eccentric disk (or sheave as it is often called) causes the desired reciprocating motion of

the valve-stem. The eccentric, like the crank, may work the valve stem either directly or through the intervention of a rocker.

With any of these arrangements, it is impossible to vary the point of cut-off of the valve, as could be done if there were some provision for altering its length of travel. It is equally impossible to reverse the engine. But variation of cut-off, and reversal of the engine, are absolutely necessary for marine and locomotive engines, and very desirable in the case of most stationary engines. The arrangement for varying the distance of the eccentric from the shaft centre enables variations of its amount of throw, and thus permits variable cut-off. Such sliding eccentrics are in common use. A similar arrangement for changing the position of the eccentric on the shaft, by angular rotation, enables reversal of the engine, either with or without variation in the point of cut-off.

The shifting eccentric has many advantages, and the means commonly adopted to effect a variable cut-off, and permit reversal of the engine, is by what is known rather improperly as the 'link-motion.' The most common of these, and which may be found under almost any locomotive in the United States, is known as the Stephenson or shifting link-motion. It has two eccentrics for each cylinder, placed side by side on a shaft (which in the case of the locomotive is a driving-axle) and connected by their rods with the ends of a curved 'link' having in it a slot the radius of which is equal to the length of the eccentric-rods. In this slot there plays a block which is attached to one end of a radius-link with its other end fastened to the end of the valve-stem. The link itself is suspended by a hanger which is connected with a lever by which the link may be raised and lowered, thus driving the block (and through it the valve-stem) with various parts of the slot and with various amount of travel, according to the height to which the link has been raised. If with the link lowered so as to bring the block in the extreme upper portion of the slot, the valve is given a maximum amount of travel in such relative direction of motion as to cause the engine to move ahead, gradually raising the link will give the valve gradually decreasing travel, and thus effect gradually earlier cut-off, until that point is reached when the valve has no motion at all, when cut-off will be at the beginning of the stroke, that is, there will be no steam admission, and the engine will not run at all. Further raising the link will give the valve gradually increasing travel in the other direction, and cause gradually later and later cut-off, the engine running backward. If the rods leading from the eccentric to the link be not crossed, the lead of the valve will increase as the cut-off is made later and later, and *vice versâ*; but if the rods be crossed, the lead will decrease as the cut-off is made later. This variation of the lead is in some cases a decided disadvantage, in others an advantage.

In the Pius Fink link-motion, the most simple of all,

there is a single eccentric, to the strap of which there is rigidly attached a link, the slot in which has its convexity toward the main shaft. Between the slot and the centre of the main shaft the link and strap are pivoted, and are attached to the swinging end of a radius-bar, whose other end is pivoted to a fixed point. There slides in the link slot a block which drives the valve-stem through a connecting rod, and whose position in the slot may be varied at will, thus changing the amount of expansion or the direction of motion while the engine is running.

Another method of driving the valve, which has been very largely introduced in marine engines, and in England on locomotives, is what is miscalled the radial gear. There is usually a radius-rod either from the crosshead, whose motion is strictly rectilinear, or from some point of the connecting rod, which of course gives an elliptical motion. This straight or elliptical motion is modified by suitable swinging links, so as to effect varying amount of valve-stem motion, also so as to cause the engine to run in either direction required.

For such cases as those where there are two or more valves for admission and two for eduction, it is usual to drive all from a 'wrist-plate' or its equivalent, which is driven by a single eccentric, or from which the valves are driven by connecting rods or other attachments. In this we have what is known as 'drop cut-off' or 'detent motion'—the connection with the exhaust-valves being constant, while that with the admission or cut-off valves is maintained only so long as the governor permits certain 'catches' to remain in action. So long as the catches are effective, steam is admitted; when by the action of the governor, they are withdrawn from action, the valves are instantly closed by a spring, weight, or dashpot. This is the method adopted in the celebrated Corliss engines, and in most of their imitations, variations, and improvements.

The S. E. is wasteful of energy, a well-designed one delivering only 10 or 12 per cent. of the theoretical efficiency of the heat from the coal. To save heat, the cylinders are commonly enclosed in a steam jacket. Cutting off steam to use its expansion would defeat itself by reason of the expanded steam tending to condense, were it not for the plan of surrounding the cylinder with hot steam, boxed into a space called a jacket. Outside this jacket there is placed a non-conducting layer, usually of strips of wood, termed wood lagging.

Rotary S. E. have been the subject of hundreds of patents, but few have come into use. As ordinarily designed, two or more pistons revolve within a cylinder like the floats of a paddle-wheel, being pushed around continuously by the steam, which is admitted and cut off alternately, so as to allow it to work by expansion. These engines have the advantage of having no reciprocating parts, but the disadvantage that the long travel of the pistons around the inside of the cylinder subjects them to great

friction. In the Hoffman rotary engine the cylinder revolves around the pistons upon an elliptical steam-chest supported by a hollow shaft, through which the steam is admitted and exhausted.

S. E. are named from the duty or work they perform, or the mechanism of which they form a part, as Agricultural Engine, a portable engine for farm work; Ballast E., one for handling railway ballast; Blowing E., see BLOWING; Draft E., a hoisting engine for mines; Feed E., a small engine for feeding water to a boiler plant; Hoisting E., one having a windlass; Mining E., a large hoisting engine for use in a shaft-house; Pile E., a steam pile-driver; Starting E., a small one for starting a very large engine; Traction E., a horizontal portable one for drawing vehicles on roads, a road locomotive. Also from some feature of mechanism or arrangement, as Automatic E., one requiring little attention; Balanced E., one in which the reciprocating parts are balanced to reduce vibration; Cross Compound E., a compound one in which the cylinders lie side by side Direct-acting E., one having no beam, the usual form; Duplex E., a compound engine; Grasshopper E., an old form having long jointed beams suggesting grasshoppers' legs; Horizontal E., one in which the cylinder is on its side; Inclined E., one in which the cylinder lies on an incline; Oscillating E., one in which the cylinder is set on trunnions, and the piston-rod connected with the crank, so that the cylinder rocks; Quadrant E., one having a four-sided chamber in place of a cylinder; Reciprocating E., the ordinary form; Rotary E., one in which the pistons are mounted like wheels and rotate in the steam chamber; Stationary E., one on a fixed base, as opposed to a portable engine or a locomotive, or an automobile engine; Trunk E., one in which the cylinder is open at one end like a gas engine, thus permitting the piston-rod to be connected to the crank; Twin E., two engines connected to work as one; Upright E., one in which the piston works up and down. S. E. are also named from the way in which they use the steam, as Condensing E., one in which the steam is condensed on the exhaust side by sudden cooling, to get the benefit of atmospheric pressure; High-pressure E., one that condenses; Low-pressure E., a non-condensing engine; Double Expansion E., a compound engine.

See BOILER, LOCOMOTIVE, STEAM-TURBINE, THERMODYNAMICS, VALVE.

Bibliography.—Consult Craddock, *Chemistry of the Steam Engine;* Clark, *The Steam Engine* (London 1890); Peabody, *Valve Gears for Steam Engines* (New York 1892); Thurston, *Manual of the Steam Engine* (New York 1892); Seaton, *A Manual of Marine Engineering* (New York 1895); Hutton, *The Mechanical Engineering of Power Plants* (New York 1897); etc. For the history of the development of the steam engine consult Thurston, *Growth of the Steam Engine* (New York 1879).

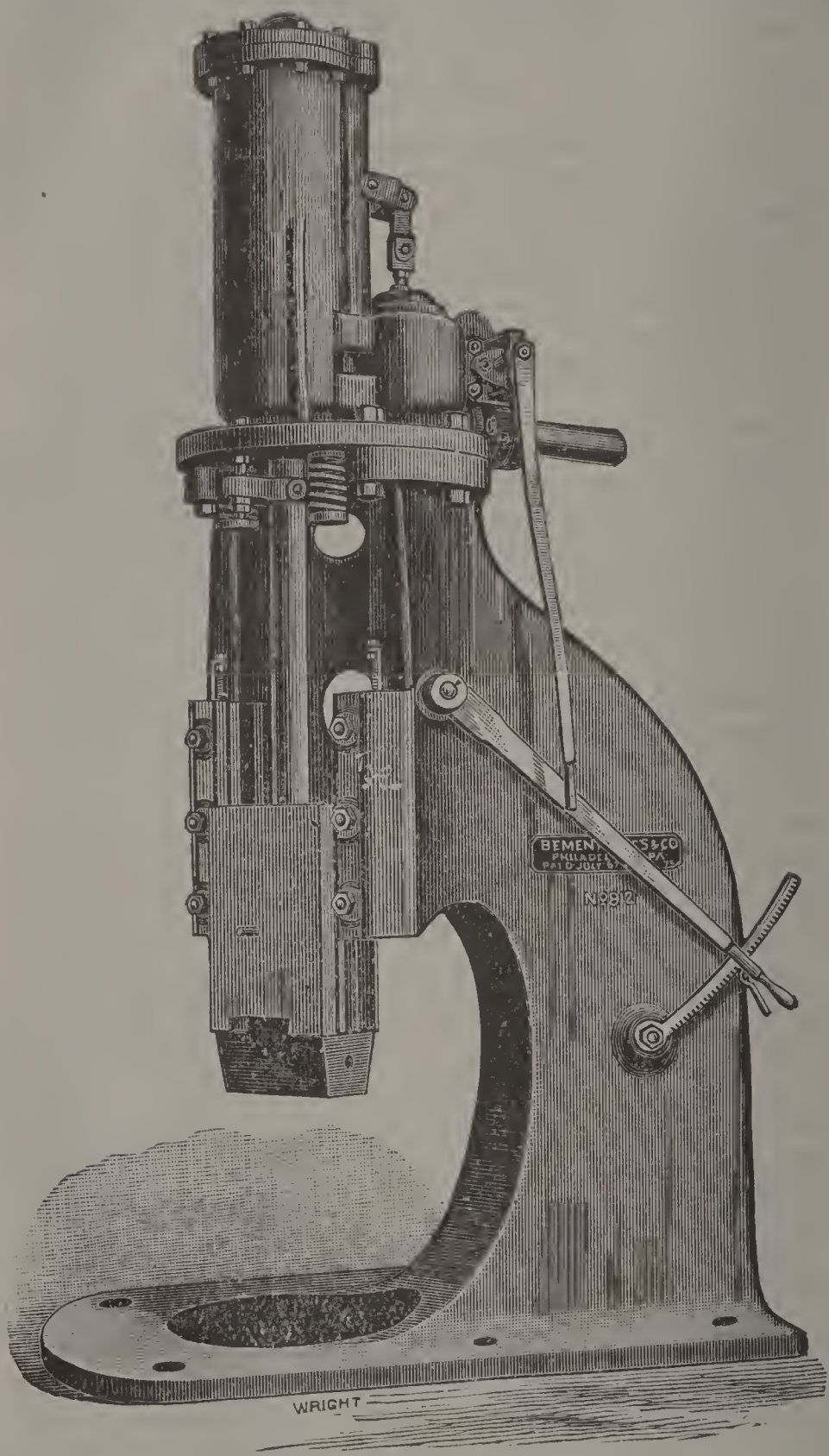
STEAM HAMMER: a most potent factor in developing one of the greatest of industries, that of iron-working; giving force, speed, and adjustability to the blows in forging; also making possible new industries, such as drop forging on a large scale. Without it, the iron steamship would have been practically an impossibility, and the locomotive would have been greatly retarded in its development.

In 1784 James Watt patented a S.-H., which seems the first on record; but he never constructed one. In 1806 Wm. Deverell patented one which like that of Watt was direct acting; but this was never built. It was not until 1839 when James Nasmyth (q.v.) sketched a plan of a S.-H. for forging the paddle shafts of the steamship *Great Britain*, that the idea again came up; but the Nasmyth hammer was not built either by or for him. Three years afterward he was surprised to find at Creuzot, France, one made from a copy of his own sketch; after which he patented it in England, and in 1843 made one. In this the ram was raised by the action of steam under a piston in a vertical cylinder to which steam was admitted by an ordinary slide valve worked by hand. This machine was defective not only by reason of the great amount of power required to move the valve, but from the fact that it was difficult to bring the ram up at once after the force of the blow had been expended. While this was necessary both by reason of increased speed of working, and because at first there was some tendency for the ram to chill the metal that was being worked, the fact that the point of impact and that at which the force of the blow was expended had no definite relation with each other and varied at each stroke, made it difficult to effect true automatic action. Nasmyth was on the point of abandoning the hammer, when Robert Wilson produced a valve motion which enabled the blows to be regulated in speed and in force, and the hammer was made absolutely automatic if desired. It was so completely under control that a common pastime was to place an egg in a wineglass upon the anvil, and after patting it delicately with the ponderous ram, suddenly smash it with a thundering blow. The substitution of Wilson's circular balanced valve for the plain slide-valve gave increased ease and precision. Later, Wilson produced the double-acting hand gear motion by which the ram was not only raised by steam, but aided thereby in its descent, thus greatly increasing not only the speed of working, but the range of force of blow. The original S.-H. had comparatively a small piston rod, with a heavy tup or ram; at present the rod itself is ponderous, and forms a considerable portion of the weight.

As at present constructed, steam-hammers not only permit the blow to be either by dead weight or occasioned by steam at will, but the operator may vary at will the length and force of the blow as well as the manner of its reception; and every hammer (except the largest, which are never automatic unless especially ordered) is either automatic or workable by hand at the will of the attendant.

STEAM-HAMMER

In addition to delivering dead and cushioned blows, the best hammers are so arranged that with them a slow steady pressure like that of a hydraulic press may be given, for



Bement Steam-hammer.

the purpose of cutting off stock, and other manipulations. The standards may be either single (in which case there is but one upright which is curved laterally) or double, which

is by far the strongest construction; and in very large machines, each leg of each vertical standard may be spread or divided to increase the accessibility of the machine and the facility by which various kinds of work may be handled on it. In large hammers the anvil has a foundation and framing supported independently from the hammer supports; and is furnished with an adjustable cap. The valve is properly constructed so that it will take up its own lost motion when it has worn; the guides are adjustable for wear, and there are taper shoes for facility of adjustment of dies. For irregular shapes, such as cranks, marine rudders, etc., and particularly for working pedestal jaws for locomotive frames, there should be an extra long stroke, say 45 inches; and for this work a ram weighing 1,600 lbs. is best; but a more usual weight of ram is 700 lbs. for heavy iron work, with a stroke of 21 inches; and for drawing down steel, where speed of working is essential, a still shorter stroke is used. For drop or stamp work the die should rest at the top of the stroke.

The S. H. has the advantage, in working large masses of metals, that its blows penetrate more nearly to the centre of the mass than those of lighter hammers, and thus render it unnecessary to overheat the outer layers in order to give the inner ones moderate heat. In drop forging it is often found convenient to make several pieces at once, connected by fins, which may very readily be cut up by the hammer itself or by a special tool. This method greatly reduces the cost of manufacture where the quantity of the articles is great, and at the same time makes the density and quality of the articles more uniform.

In Condie's modification the cylinder itself formed the ram; but this system has gone out of use. There have been made duplex hammers in which there is no anvil, but the object to be forged is struck by rams from two opposing sides: these have not come into common use. See HAMMER, STEAM OR POWER: FORGING: WELDING.

STEAM-HEATING: see WARMING AND VENTILATION.

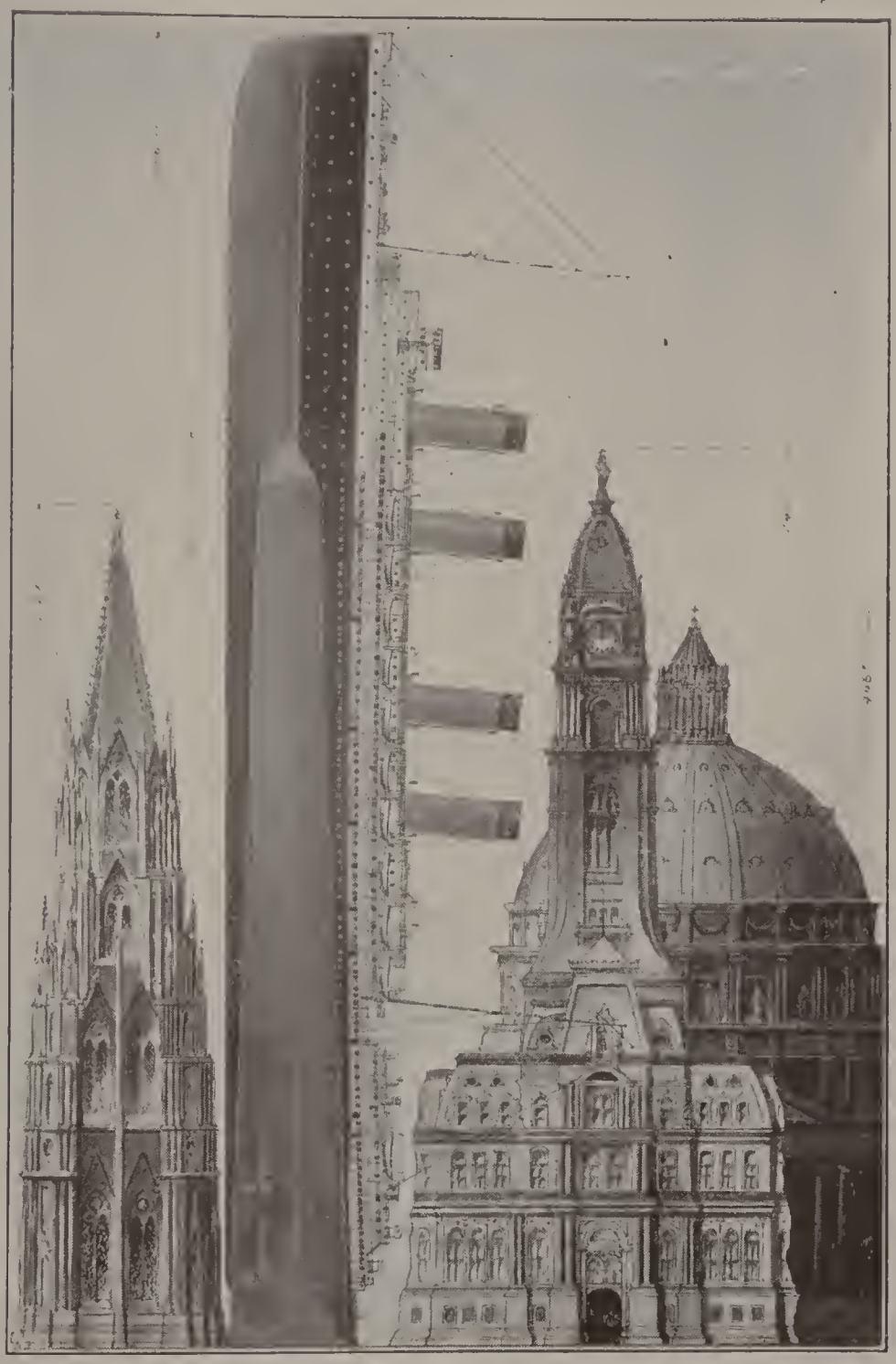
STEAM-NAVIGATION.

STEAM-NAVIGATION: modern development of the use of steam in the propulsion of vessels. The first recorded attempt at S.-N. was that of Blasco de Garay in the harbor of Barcelona 1543. The fact is surprising that 30 years should have elapsed—between 1777, when the steam-engine had become in Watt's hands an efficient power, and 1807, the date of Fulton's first voyage —before a really serviceable steam-vessel was produced. The connecting link seems to be the use of revolving-paddles instead of oars. Wheel-boats propelled by oxen, horses, or men were known to the Romans, and were used for ferry-boats in modern times.

As early as 1736, Jonathan Hulls had taken out a patent in England for a tow-boat to be propelled by a paddle-wheel set in motion by a sort of steam-engine: the project appears never to have been executed. Besides some experiments on the Seine by Comte d'Auxiron 1774, and Perier 1775, the Marquis de Jouffroy constructed a steam-boat of considerable size 1782, which navigated the Saône for some time; but it was deficient in power. In the United States experiments began to be made about 1783, by John Fitch (q.v.) and Rumsey. Fitch launched a paddle steamboat 1787, which moved at the rate of three miles an hour; but before proceeding far the boiler burst: Fitch's fourth steamboat (1790) made 8 m. an hour on the Delaware. Rumsey proposed to propel the vessel by making a stream of water issue with force from the stern; his attempt failed.

The next important experiment was by Miller, of Edinburgh, and Taylor, tutor in his family, 1788, Oct. 14, on a small lake in Dumfriesshire. A small engine having four-inch cylinders of brass was prepared, under Taylor's superintendence, with help of Symington an ingenious mechanic, and was fitted on board a double-boat, with a paddle-wheel in the interspace. Next year a vessel in which Miller had had larger engines fitted was tried on the Forth and Clyde canal, and moved at the rate of seven miles an hour. In 1801, Symington took out a patent for construction of steamboats; and 1803 built the *Charlotte Dundas* to tow vessels on the Forth and Clyde canal. The success seems to have been complete, except that the agitation of the water by the paddles washed down the banks in an alarming manner. The use of the vessel was therefore given up, and it lay at *Lock Sixteen* for many years.

In the meantime, attempts had been made at S.-N. in the United States by Stevens, Livingston, and others. John Fitch's paddle steamboat (first 1785) has been referred to above. Robert Fulton (q.v.) had given attention to steam as a motive-power for vessels as early as 1793: travelling into Scotland, he visited the unfortunate *Charlotte Dundas*, and obtained drawings of the machinery. Returning to America with one of Boulton and Watt's engines of 20 horse-power, he, in conjunction with Livingston, built a vessel called the *Clermont*, at New York, and in 1807 made the first really successful long voyage by steam,



Cologne Cathedral (512 feet). | Washington Monument (555 feet). | City Hall Philadelphia (548 feet). | St. Peter's, Rome, (448 feet).

New Cunard 25-Knot Liner Compared With the Tallest Buildings of the World.

from New York to Albany up the Hudson. The vessel sailed 110 m. in 24 hours, against stream and wind. Fulton has thus the honor of having first proved the practical utility of steam-navigation for long distances; though the steam-packet built by John Fitch had made short trips on the Delaware (1790). Nothing but money seems to have been lacking to Fitch for equal success; and nothing but perseverance to Miller, Taylor, and Symington. Four years later, 1811, Henry Bell of Glasgow, who had witnessed the experiments on the canal 1789, and had accompanied Fulton on his visit to the *Charlotte Dundas*, started a steamboat, the *Comet*, on the Clyde, and was thus the father of steam-navigation in Britain.

In 1815, a steamboat made a passage from Glasgow to London; and 1818, one plied from New York to New Orleans; 1820 steam-packets were established between Holyhead and Dublin. 1838 was a memorable year in the history of steam-navigation. The steamer *Sirius* sailed from Cork, Ireland, Apr. 4; the *Great Western* from Bristol, England, Apr. 8: both arrived at New York on the 23d, the *Sirius* only 12 or 15 hours before the other. The passage is now often made from Queenstown to New York in six days. The opening of the Suez canal greatly promoted swift steam-communication with India, China and the East, and Australia. Since 1880 some of the Orient line of steamers make the passage from Plymouth to Australia in 30 to 35 steaming days. Steam-vessels are now found on all seas and on lakes and streams. War-steamers have taken the place of the old ships of the line: and steam has largely superseded sails. The maximum speed yet attained by steam-vessels is about 25 m. an hour; the ordinary rate 8–15 miles.

The steam-engine employed to propel a vessel does not differ essentially from any other; but only by some special modifications. In ships of war the cylinders are generally placed horizontally, and the whole machinery kept below the water-line; in merchant-vessels vertical engines are more common, with the cylinders inverted, placed right above the propeller-shaft. The tendency is to replace the paddle-wheel by the screw. On the latest ocean ships twin-screws have been introduced, set sometimes one in advance of the other and sometimes revolving at slightly different speeds, or else set symmetrically. In such cases the best practice is to have a complete longitudinal bulkhead, dividing the engine and boiler rooms, with their contents, into two complete isolated parts, working independently. On some war-vessels three screws have been proposed. Bow and stern screws are now sometimes used, especially on ice-boats and double-ended ferry-boats: they are becoming the favorite type in the waters of New York city. A single line of shafting runs from bow to stern of the boat, and carries screws of identical pitch and diameter, one at each end of the boat: these are found to be exceedingly efficient in ice, and in making their way into their slips.

The modern first-class ocean ship is about 600 ft. long,

50 to 60 ft. wide, and 40 ft. deep: it will rate at about 10,000 tons. There are a large number (15 or 20) of water-tight compartments, and a double bottom often adds to the ship's safety. The engine is generally of double or triple expanding type, and can develop 10 to 20 thousand horse-power. The steam-pressure is constantly increased, recent ships carrying 150 lbs. to 180 lbs. pressure per sq. inch. The coal consumption may be more than 300 tons per day. The engines consume little water—the condensing arrangements being so perfect. As a type the *Teutonic* of the White Star Line, plying between New York and Liverpool, may be cited: the length is 582 ft.; width 57 ft. 5 inches; depth 39 ft. 4 inches; tonnage 9,685; horse-power 17,000; steam-pressure 180 lbs. per sq. inch: there are 11 transverse bulkheads, with self-closing doors: the cylinders are 43 inches, 68 inches, and 110 inches diameter: the stroke is 5 ft. Forced draught is used in the furnaces. The propellers are 21 ft. 6 inches diameter, and 28 ft. 5 inches pitch.

Modern ocean vessels are generally of steel and iron; wood still is used in this country for many river boats, though metal hulls are being more used each year. The American type of river steamer has very wide guards, nearly doubling the width of deck. In wooden river steamers the hull is often strengthened by trusses, called 'hog-frames.' In iron vessels this is not needed.

Many paddle-wheel steamers are still in use on the inland waters of this country. On these boats the innovations are in the direction of compounding the engines, using direct-acting instead of walking-beam engines, and in the successful introduction of feathering paddles. A minor invention is the auxiliary steering-screw for propellers, invented by a Hungarian engineer, J. J. Kunstädter. This is a smaller screw carried directly aft of the main screw, but having a short independent shaft of its own journalled in the rudder, and connected to the main shaft by a universal joint. This screw rotates therefore with the main screw, but is carried to one side or the other with the rudder so that it aids materially in turning the vessel.—See STEAM-ENGINE: PADDLE-WHEEL: SCREW-PROPELLER..

STEAM-TURBINE: a machine for utilizing steam by its momentum rather than its pressure. It may be regarded as a development of the steam-engine, or as an adaptation of the water turbine to use with steam. The idea of using steam in this manner is very old, but it was not reduced to successful practice until recent times. The motion of steam when blown out of a boiler is so swift that a mechanism was not readily devised to move fast enough to get the benefit of the great momentum. Finally, in 1883, De Laval devised a steam-turbine, which was a wheel with numerous curved buckets in the rim, and mounted on a very slender axle. Several steam jets were directed against the buckets and drove it around.

This succeeded largely because the slender axle permitted the wheel to turn around the exact center of its weight, whereas with a stiff axle a wheel turns about its theoretical center of gravity. No wheel can be made perfectly, and when one is rotated at a velocity of a thousand times a second the irregularity is manifested in a destructive vibration, unless the axle be slight enough to yield. After this success the steam-turbine developed rapidly, and means were devised for reducing the speed of rotation. As now made, they have commonly a surface speed of 600 to 1,200 feet a second, and the turbine proper does not make more rotations than many other forms of motor. C. A. Parsons, a Swedish engineer, has greatly improved the steam-turbine, developing the machine now manufactured by the Westinghouse Company. In these machines a reduction of speed is obtained by causing the steam to pass through a winding course, reacting against the surfaces of curved blades, which were alternately fixed and movable. Jonval, Curtis, Rateau and Dow have all shared in the improvement of the steam-turbine, which is now replacing the steam-engine in many cases where large powers are demanded. See TURBINE.

STEAN, or STEEN, n. *stēn* [AS. *stœna*, a drinking-vessel]: in *OE.*, an earthen drinking-pot; a jar.

STEARIN, n. *stē'ă-rĭn* [Gr. *stĕar*, suet, *stĕātos*, of suet; F. *stéarine*]: the tristearate of glycerin, a constituent of fat. STEARIC, a. *stē-ăr'ĭk*, pert. to stearin, or obtained from it, as *stearic acid*. STEARATE, n. *stē'ă-rāt*, a salt of stearic acid. STE'ATITE, n. *-tīt*, soft magnesian or talcose mineral; soapstone (see below). STE'ATITIC, a. *-tĭt'ĭk*, pert. to soapstone. STEATOCELE, n. *stē-ăt'ŏ-sēl* [Gr. *kēlē*, a tumor]: a tumor seated in the scrotum, consisting of a suety substance. Stearic acid is an organic, fatty acid, which occurs (in combination with glycerin) in many of the fixed natural fats, and especially in those which are relatively hard at ordinary temperatures. It has the chemical formula $C_{18}H_{35}O.OH$, and is monobasic, the only one of its hydrogen atoms that is replaceable by a base being that in the hydroxyl radical. Stearic acid is insoluble in water, but dissolves in alcohol and in ether, from which it is deposited in the form of brilliant pearly crystalline scales or plates. It melts at 156° F., but cannot be boiled under normal atmospheric pressure without partial decomposition. Under a pressure of 15 millimetres of mercury (about one-fifteenth of an atmosphere), it boils at 450° F., and may be distilled without change. Its density, at ordinary temperatures, is practically the same as that of water. It has neither taste nor odor. It burns very much like wax, and is extensively used in the manufacture of fine candles, either alone or when mixed with paraffin. Stearic acid forms salts (known as 'stearates') with alkalies, alkaline earths, and metallic oxids; ordinary soap (q.v.) usually containing

a greater or lesser proportion of stearate of sodium or of potassium. With glycerin, stearic acid forms three well-defined compounds, which are respectively known as 'monostearin,' 'distearin,' and 'tristearin.' Of these the last is by far the most important, since it occurs in large quantities in many of the natural fats. Tristearin (which is the substance that is understood when 'stearin' is mentioned without further qualification) may be prepared by filtering melted suet to remove the fibrous matter that it contains, and subsequently dissolving the tristearin from the filtrate by the aid of hot ether. Upon the evaporation of the ether, tristearin separates in the form of white, lustrous plates, which are not greasy, though they are soft to the touch. It is insoluble in water, but dissolves readily in ether, and, to a lesser extent, in hot alcohol. The so-called 'stearin' of which candles are made is not true stearin, but stearic acid, as noted above. The stearins may be prepared artificially by heating stearic acid with glycerin, provided too high a temperature is not attained; the resulting compound being monostearin, distearin, or tristearin, according to the proportion of the mixture, the temperature to which it is exposed, and the duration of the treatment. Glycerin has the formula $C_3H_5(OH)_3$, and, from the chemist's point of view, it is a tri-atomic alcohol;—that is, it is a tri-hydrate of the fatty organic radical 'propenyl' (or 'glyceryl'), C_3H_5. Stearic acid, similarly, is regarded as the hydrate of the monovalent radical 'stearyl,' $C_{18}H_{35}O$. When stearic acid and glycerin combine, the action consists in the replacement of one, two, or all three of the hydrogen atoms in the hydroxyl radicals of the glycerin by an equal number of stearyl radicals; and the prefixes 'mono-,' 'di-,' and 'tri-,' in the name of the resulting compound, refer to the number of stearyl radicals that are present. The reaction, in the case of tristearin, is as follows:

$$C_3H_5(OH)_3 + 3C_{18}H_{35}O.OH = C_3H_5(O.C_{18}H_{35}O)_3 + 3H_2O.$$

Glycerin Stearic acid Tristearin Water

Tristearin possesses the singular property of having two melting points. Thus pure tristearin melts when it is heated to 131° F.; but if the temperature is raised, it becomes solid again, remaining so until, at 162° F., it takes the liquid form a second time. Commercially, stearin is obtained by straining liquefied fat, cooling the filtrate (sometimes nearly to 32° F.), and expressing the fluid portion by the application of great pressure. The solid part that remains behind consists very largely of stearin, though a really pure product cannot be obtained by this method. Upon treatment with superheated steam, especially in the presence of a small quantity of lime, tristearin is resolved into stearic acid and free glycerin; and this process, or some modification of it, is largely used in the arts for the preparation of commercial stearic acid. Pure stearic acid may be prepared

by the following method: Suet that has been melted and strained is saponified by prolonged heating with an aqueous solution of sodium hydrate; the glycerin that the fat contains is thereby liberated in the free state, while the fatty acids combine with the sodium, to form the stearates, palmitates, and oleates of sodium. Sulphuric acid is then added to the solution, with the result that sulphate of sodium is formed, and the fatty acids that were combined with the sodium are set free. The stearic acid that is thus precipitated (and which is quite impure) is removed from the solution, and recrystallized from solution in hot alcohol. An alcoholic solution of these crystals is then mixed with a boiling alcoholic solution of magnesium acetate, by which means an insoluble precipitate of magnesium stearate is obtained. The magnesium stearate is finally decomposed by the addition of hydrochloric acid, and the liberated stearic acid is then crystallized once more from alcohol. The substance known as 'shea-butter' is a specially favorable material for the preparation of stearic acid, since it contains no other solid fatty acid. Shea-butter resembles palm oil, except that it is notably redder, and it is prepared from the fruit kernels of the karite, or shea-tree (*Butyrospermum Parkii*), which grows in central and western Africa. Shea-butter is used by the natives of Africa as an article of food, and it is now imported into Europe in considerable quantities, for the manufacture of soap.

STEAROPTENE, n. *stē'ă-rŏp'tēn* [Gr. *stĕar,* suet; *ptēnos,* winged]: a solid crystalline matter deposited from many essential oils, allied to camphor. See OILS.

STEATITE, *stē'a-tīt,* or SOAP'STONE: mineral composed principally of silica and magnesia, with more or less alumina and water. It is found massive, or sometimes assuming the forms of the crystals of other minerals which it has replaced. It is plentiful in many parts of the world, and is found in various localities in Vt. (Grafton, Athens, Westfield, etc.); in N. H. (Francestown, Pelham, Keene); in Mass. (Middlefield, Chester, etc.); in Md., Va., N. C., Ariz., S. D., etc. Steatite is generally white, reddish white, or yellow. It is soft and greasy to the touch, easily cut, but broken with difficulty. It is used in manufacture of porcelain. It writes readily on glass, and is used by glaziers for marking plates of glass before they are cut with the diamond. Tailors use it for marking cloth before they cut it. It is used also by shoemakers, to give unctuosity to the heels of stockings, that new boots may more easily be tried on. It is sold for such purposes under the names of Briançon Chalk, French Chalk, and Venice Talc. Slate-pencils made of steatite are much used in the United States. Steatite readily absorbs oil or grease, and is used in powder for extracting spots of them from silken and woolen stuffs. It is the basis of rouge. It is used for imitating engraved stones, being easily cut, and afterward hardened by heat; after which, it may be

colored by metallic solutions. It is largely used instead of firebrick in the construction of smelting furnaces, and for lining ranges, heaters, etc., also for making griddles. The American aboriginals made culinary utensils, tobacco pipes, symbolic figures, etc., of steatite. For the fibrous form of steatite and its uses, see TALC. The *Agalmatolite* or *Figure-stone* of China is a kind of steatite, containing a little potash. Exquisite specimens of Chinese workmanship in this material are familiar. The earth eaten by the savages of the banks of the Orinoco and of New Caledonia is a kind of soft steatite.

STEATO-, prefix *stē-ă-to,* or STEAT- [Gr. *stear, steatos,* tallow, hard fat]: fatty; composed of or resembling fat.

STEATOMA, n. *stē'ă-tō'mă* [Gr. *steatōmă,* a kind of fatty tumor—from *stear,* fat]: a tumor containing a substance resembling fat. STE'ATOM'ATOUS, a. *-tŭs,* of the nature of a steatoma or fatty tumor.

STEDFAST, *stĕd'făst:* a spelling of STEADFAST (q.v.).

STEDINGERS, *stĕd'ĭng-ėrz,* THE: community of Frisian Hollanders, 12th and 13th centuries, who settled on the lower Weser river, and resisted undue priestly domination. They were opposed to large exactions; and a crisis came when a priest at communion put into the mouth of one of their noblewomen, instead of the holy wafer, a groschen that she had paid at confessional. Her husband, finding that the complaint that he made was scorned, killed the priest. Hartwig II., Archbishop of Bremen, demanded that the husband be delivered up and a large indemnity paid. This was refused, and a long crusade followed, renewed at times, 1207-34, when 11,000 Stedingers were defeated finally at the battle of Altenesch; and killed, burned at the stake, or scattered. They were falsely accused of offering their children to an idol of Ammon. In 1834 a monument was erected to these valiant victims.

STEDINGK, *stä'dēngk* or *stĕd'ĭngk,* CURT BOGISLAUS LOUIS CHRISTOPHER, Count VON: soldier, who participated in the Amer. revolution: b. Pinnau, Pomerania, then Swedish territory, 1746, Oct. 26. He graduated at the University of Upsala; served in war against Prussia; was lieutenant-colonel of a Swedish regiment aiding France; embarked for America in the fleet of Count D'Estaing 1778; led a brigade in the action at Grenada, West Indies; distinguished himself by signal bravery, and was wounded in the siege of Savannah 1779; was engaged in the Russo-Swedish war 1787; was ambassador of Sweden at St. Petersburg 1790, and plenipotentiary in the peace conference at Paris 1814.

STEDMAN, *stĕd'man,* EDMUND CLARENCE, A.M., LITT.D.: poet and critic: b. Hartford, Conn., 1833, Oct. 8; d. 1908. He studied at Yale College; but did not graduate in course: the college authorities, however, conferred on him 1871 the degree M.A. and later LITT.D. He

edited a newspaper at Norwich, Conn. 1852-54, and one at Winsted, Conn., 1854-56. Then settling in New York, he contributed poems to magazines and to the New York *Tribune;* among his lyrics of this period being: *The Diamond Wedding; How Old John Brown Took Harper's Ferry;* and the *Ballad of Lager-bier.* He was with the Army of the Potomac as correspondent of the New York *World* 1861-63. Returning to New York 1864, he adopted the business of stock-broker. His leisure was still given to literature; and he has since published numerous poems, many of them 'occasional' pieces. He published (1876) *Victorian Poets,* containing critical analyses of the writings of English poets during the reign of Queen Victoria; followed by *Poets of America* (1885). With Ellen Mackay Hutchinson he edited *A Library of American Literature* (11 vols., 1890). His collected poems were published 1884. He has delivered courses of lectures at Johns Hopkins, Yale, and Columbia universities on the *Nature and Elements of Poetry* (afterward published in book-form), and in 1897 appeared *A Victorian Anthology,* and in 1900, an *American Anthology.*

STEED, n. *stēd* [AS. *stēda,* a horse or stallion: Gael. *steud,* a horse, also to run: a horse from the *stud*]: a horse of high mettle for state or war. STEED'LESS, a. *-lĕs,* without a horse.

STEEDMAN, *stēd'man,* CHARLES: naval officer: 1811, Sep. 24—1890, Nov. 13; b. Charleston, S. C. At the age of 17 he entered the navy; served in the war with Mexico; in the Paraguay expedition was in command of the *Dolphin;* was loyal to the Union during the civil war, assisted in organizing the Mississippi river naval forces, and in various operations along the s. Atlantic coast, and commanded the *Ticonderoga* in a voyage to Brazil in pursuit of a Confederate cruiser. He was in charge of the navy-yard at Boston 1869-72, and in command of the s. Pacific squadron 1872-3. He became captain 1862, commodore 1866, rear-admiral 1871, and retired from the service 1873, Sep. 24. He died at Washington.

STEED'MAN, JAMES BARRETT: soldier: 1818, July 30—1883, Oct. 18; b. Northumberland co., Pa. He removed to Ohio 1837; became a canal contractor, member of the legislature 1843, went to California for gold 1849, but soon returned to Ohio; served on the state board of public works, and was afterward government printer at Washington. In 1861 he entered the Union army as colonel of an Ohio regiment, rendered distinguished service at Chickamauga and other points; was promoted major-general 1864; was provisional governor of Georgia, and collector of internal revenue at New Orleans; was elected to the Ohio state senate 1879, and 1883 was chief of police of Toledo, in which city he edited a weekly paper. He died at Toledo.

STEEK. See STEIK.

STEEL, n. *stēl* [Icel. *stál;* Dan. *staal;* Ger. *stahl,* steel]: iron refined and combined with carbon, used in making edge tools, etc., and now largely used in place of iron (see below): weapons made of steel, as swords: an instrument used by butchers and others for sharpening their knives: V. to point or overlay with steel; to make very hard; to make insensible or obdurate, as the heart. STEEL'ING, imp.: N. among *cutlers,* the act or process of welding a piece of steel on that part of a cutting instrument which is to receive the edge. STEELED, pp. *stēld:* ADJ. hardened; made insensible. STEELY, a. *stēl'ĭ,* having the character or qualities of steel; in *OE.,* made with steel; hard; unfeeling. STEEL-CLAD, a. covered or armed with steel. STEEL-HEARTED, a. *figuratively,* having the heart as hard as steel.

STEEL: steel may be defined as a modified form of iron, an alloy of iron and carbon, not found in nature, and of the greatest industrial importance. More exactly steel has been defined by Howe as iron which is malleable at least in one range of temperature; and is either cast into a mass that is initially malleable; or is capable of hardening by sudden cooling, or is both so cast and so capable of hardening. Steel is sometimes defined as a modified form of iron containing more carbon than wrought iron and less than cast iron, but this definition is not exact, since some so-called mild steels contain as little carbon as wrought iron. The physical properties of commercial forms of steel vary widely according to variations in the amount of carbon present, the mode of its association with the iron, etc. Steel is an alloy, that is, a metallic mixture usually containing three classes of ultimate constituents: (1) pure metals, (2) definite chemical compounds of these metals with each other and definite chemical compounds of the metals with metalloids like sulphur and carbon, (3) solid solutions, called also isomorphous mixtures of the metals, in which the metals are intimately mingled but not in definite ratios. The study of metals under the microscope (called metallography) during the past 20 years has greatly increased our knowledge of the composition and structure of alloys. For instance alloys have many resemblances to igneous rocks, that is, rocks formed by cooling from a state of fusion. These rocks exhibit all gradations from a structureless glass, in which the elements are indiscrimately mingled, through rocks in which certain definite minerals have crystallized out, to those that are completely crystalline, the elements all being combined as definite chemical compounds in the form of determinable minerals. Following this analogy we have alloys that are partly crystalline, the crystals of metals and of certain definite chemical combinations of the metals and metalloids lying in a solid solution. Such alloys may be said to have a porphyritic structure, while those that are completely crystalline may be called granitic. The structure of an alloy is studied by

using means to differentiate the surface of a mass, such as continued gentle rubbing which causes the harder constituents to stand in relief, the use of a solvent which attacks one constituent more than another, the use of a stain which will adhere to or slightly penetrate certain constituents or a combination of two methods. The surface after treatment is observed through the microscope.

Microscopic Structure.—Under the microscope ordinary commercial iron and steel are seen to be mixtures of minute particles of definite substances in widely varying proportions. The principal substances are: (1) ferrite, pure metallic iron, extremely soft and ductile, and (2) cementite, an iron carbide (Fe_3C), extremely hard and brittle. To the different ratios of ferrite to cementite are due the different properties of the many varieties of iron and steel, what is known as 'hardened' steel excepted. The soft steels consist almost wholly of ferrite, with perhaps 1 per cent or less of cementite; in harder steel there is about 92.5 per cent of ferrite and about 7.5 per cent of cementite; this per cent of cementite representing 0.5 per cent of carbon in the steel. The other important constituents of iron and steel are graphite, slag, and austenite. Graphite, an important constituent of gray cast iron, and slag, a silicate of iron and an important constituent of wrought iron, are not found in true steel, but all steel hardened by sudden cooling from a red heat contains austenite, a solid solution of carbon in iron, forming a hard, brittle mass. The percentage of carbon varies from 0 to 2 per cent (from 0.75 to 2 per cent in commercial grades of hardened steel). Pearlite, a solid solution alloy consisting of interwoven microscopic plates of ferrite and cementite, contains about 0.9 per cent of carbon, and is the essential ingredient of slowly cooled steel, the rest of the mass being chiefly ferrite in steel containing under 0.9 per cent

CARBON CONTENT AND MICROSCOPIC CONSTITUTION OF STEEL.

Total carbon per cent	Unhardened steel or pearlite series			Hardened steel or austentite series	
	Name	Microscopic constitution per cent		Name	Microscopic constitution
		Ferrite	Cementite		
0.05 to 0.3	Low carbon or mild steel	99.25 to 95.5	0.75 to 4.5	Low-carbon steel, hardened	Chiefly low-carbon austentite
0.3 to 0.8	Medium carbon steel	99.5 to 88.0	4.5 to 12.0	Medium-carbon steel, hardened and tempered	Chiefly medium-carbon austentite
0.8 to 2.0	High-carbon steel unhardened	88.0 to 70.0	12.0 to 30.0	High-carbon steel, hardened and tempered	Chiefly high-carbon austentite

carbon and cementite in steel containing over 0.9 per cent.

Classification of Steel.—The important varieties of steel and iron may be, according to Howe, classified in four different ways: (1) by presence or absence of slag, (2) by carbon content, (3) as carbon or alloy steels, (4) by method of manufacture. By the second, which is much the most important way, there are three classes of iron and steel: (1) soft or low-carbon steel and wrought iron (wrought iron contains slag; soft steel does not) with less than 0.3 per cent of carbon; both are soft, ductile, and of little hardening power, but are much stronger than cast iron; (2) medium and high carbon, or half-hard and hard steels, containing 0.3 to 2 per cent of carbon; harder, less ductile and stronger than low carbon steels and with marked hardening power; (3) cast iron, containing more than 2 per cent carbon, weaker and less ductile than the two former classes, with part of the carbon present as graphite.

Alloy Steels.—These steels have come into extensive use for special purposes, and their production will undoubtedly greatly increase. The chief are nickel steel, manganese steel, chrome steel, molybdenum steel and tungsten steel. The qualities sought in these steels are strength and hardness with ductility. Nickel steel contains from 3 to 3:5 per cent nickel and about 0.25 per cent carbon. It has very great tensile strength, hardness and ductility with a high limit of elasticity. For these reasons, practically all battleship armor now is made of it. It is also extensively used for shafting, particularly for propeller shafts, and is being tested for rails. Manganese steel contains about 12 per cent manganese and 1.5 per cent carbon. It has very great ductility with great hardness, in this combination of qualities excelling any other alloy known when it was discovered by Hadfield. It is too hard to be shaped by cutting tools. Heating and cooling does not destroy its temper. It is used for safes. It is also used for rock-crushers and mine-car wheels. Chrome steel, which contains usually about 2 per cent chromium and 0.8 to 2 per cent carbon, has when hardened by sudden cooling, great hardness with a high elastic limit; hence it is not deformed by shock. It is used for stamp-mill shoes and dies, for armor-piercing projectiles, and for safes. Tungsten steel, which contains usually 5 to 10 per cent of tungsten (sometimes over 20 per cent) and 0.4 to 2 per cent of carbon, retains a magnetic charge well, hence is used for permanent magnets. As it keeps its temper even at a red heat it is used for metal-cutting tools, which will cut even when the heat from friction of the tool is so great that the chips of metal removed glow visibly. One of the first of these so-called self-hardening steels, Taylor-White steel, contained 8.5 per cent tungsten, 3 to 4 per cent chromium and 0.75 to 1.25 per cent carbon. In the latest of these steels the tungsten is sometimes higher and the chromium may be replaced by 1 to 4 per cent of

magnanese. Molybdenum steel resembles tungsten steel, molybdenum being used because 1 per cent of it replaces in effect 2 per cent of tungsten.

Methods of Manufacture.—Steel, or at least iron containing sufficient carbon to possess a steely character, may be manufactured by any of the processes employed for the production of wrought iron (see IRON MANUFACTURE); that is, (1) in the catalan and other similar forges in which wrought iron is extracted directly from iron ores; (2) in the finery furnace, in which wrought iron is obtained through the refining of pig iron in contact with charcoal; and (3) in the puddling furnace, in which wrought iron is produced through the refining of pig iron in a reverberatory furnace, that is, in a furnace in which the fuel does not come in contact with the material treated. The steely product of the catalan and other forges was known as 'natural steel,' that of the finery furnace as 'raw steel,' while steel obtained in the puddling furnace is called 'puddled steel.' These methods, however, have now been displaced by more modern processes for the manufacture of steel. The production, in these early furnaces, of iron containing a relatively large amount of carbon calls for some modifications in the conduct of the operation, resulting in a more highly carburizing condition, but it involves no decided departure from the practice outlined under IRON MANUFACTURE.

It should be borne in mind that the metallic masses resulting from the above operations are obtained in a pasty condition, and are therefore mixed with considerable slag. The advent of the modern methods for the production of steel, soon to be described, and by which steel is obtained in a liquid condition, and, therefore, free from slag, was followed by a reluctance on the part of many metallurgists to give the name of steel to any carburized iron obtained pasty, and in English-speaking countries and in France there exists an understanding, tacit at least, to reserve the name of steel for the products of the modern methods, that is, of those methods yielding molten steel capable of being cast, namely, (1) the crucible steel process; (2) the Bessemer steel process; and (3) the open hearth steel process. Before describing these modern processes, however, mention must be made of another early method of obtaining steel, namely, the cementation process.

The Cementation Process.—The origin of this process is unknown, but it had undoubtedly been used for a long time before Huntsman's invention of the crucible steel process in 1740. The cementation process consists in heating small pieces of wrought iron to a high temperature and surrounded on all sides by charcoal. In this way the iron absorbs a certain amount of carbon and is converted into 'cemented' or 'converted' steel. The surface of the iron is covered with small blisters, and the name of 'blister' steel is also frequently used for this metal.

Briefly stated, the operation is as follows: Small bars of wrought iron, measuring generally about 3 inches wide and ½ inch thick, are placed in a 'converting pot' or vessel made of stone and measuring 4 feet deep, 4 feet wide, and some 12 feet long. Two of these pots are generally placed side by side in a furnace. Sufficient charcoal is used to completely surround each bar, and the pots are made air-tight by covering them with 'wheel swarf,' or the waste of the grinding wheels upon which steel is ground. Each pot contains about 30 tons of iron. A coal fire is used and the flames, as they come from the fireplace are made to play on all sides of the converting pots on their way to the chimney. The pots are heated to a white heat and kept at that temperature for 8 to 11 days, according to the degree of carburization desired. The furnace is then allowed to cool for about 14 days. It will be seen that the complete operation lasts about three weeks.

The product of the cementation furnace is necessarily heterogeneous, containing more carbon near the outside than in the center, which, of course, is a serious objection. To secure more uniformity the bars of blister steel are frequently cut into small pieces, piled, heated to a welding heat, and drawn into a long bar, the metal being then known as 'shear steel.' The same treatment was sometimes repeated, that is, shear steel was cut in small pieces, heated, and drawn, when the resulting bars were called 'double shear steel.' Dr. Percy writes that 'the name [shear steel] was given it because it was the kind used for the blades of shears formerly employed for cropping woolen clothes.' While cemented or blister steel and shear steel were at one time extensively used whenever high grade and high carbon steel was needed, blister steel at the present day is used only for conversion into crucible steel, as described below. It is manufactured chiefly in Sheffield (England), there being no converting plant in the United States.

The Crucible Steel Process.—Before the invention of the crucible steel process the only steel or steely iron made was obtained (1) in the catalan or similar forges, directly from the ore; (2) in the finery furnace, from the refining of pig iron; and (3) in the cementation furnace, by the carburization of solid wrought iron. These various steels, being obtained in a pasty condition, were necessarily very heterogeneous and mixed with slag. A more uniform metal and one freer from slag was very much needed, and such steel was supplied to the world in 1740 by an English clockmaker, Benjamin Huntsman, the inventor of the crucible steel process.

As first carried on by Huntsman the process consisted in melting small bars of cemented or blister steel in crucibles, an operation which necessarily led to greater uniformity and to the elimination of slag, and it is still essentially the method prevailing in England, and espe-

cially in the celebrated Sheffield district. An important modification of the original crucible process consists in melting in crucibles bars of wrought iron mixed with the necessary amount of charcoal to produce the desired degree of carburization, thus doing away with the cementation of the iron as a separate operation, and this is the method prevailing in the United States. Finally, considerable steel scrap is also at present frequently added to the crucible charges.

The crucibles used are made either of clay or of a mixture of about equal parts of graphite and clay, the former being known as clay crucibles, the latter as graphite crucibles. The clay crucibles are very generally used in England, while in the United States graphite crucibles are preferred. For the production of high-grade crucible steel Swedish wrought iron of very great purity is imported by English steel makers and converted by them first into cemented steel and then into crucible steel.

Manganese, usually in the shape of ferromanganese, is generally added to the steel because of the good effect of that element in making steel sounder and more forgeable. Besides ovide of manganese, ferro-manganese, and spiegeleisen, many other substances were and are still added by some manufacturers to the crucible charges, such as salt ammoniac, common salt, potassium cyanide, potassium chromate, etc., but it is now believed by most enlightened metallurgists that these substances, frequently referred to as 'physics,' are mere nostrums.

In later years the addition of a small amount of aluminum to the crucible charge just before teeming has become quite general, the beneficial effect of aluminum on the soundness of steel ingots having been proved beyond doubt.

The crucibles, which generally hold from 60 to 100 pounds of stock to be melted, are covered and placed in melting furnaces, which are generally of three kinds: (1) ordinary 'melting holes,' in which the crucible is surrounded on all sides by coke or coal; (2) regenerative furnaces, heated by producer gas and in which the flames and gases only come in contact with the crucibles (see *Open Hearth Steel Manufacture*); and (3) oil furnaces. After the crucible charges are melted, the crucibles are allowed to remain in the furnace for 30 to 60 minutes, this period being known as the 'killing period,' as an attempt to cast the steel as soon as melted would result in unsound ingots. The contents of each crucible are then poured into small castiron molds, yielding small ingots seldom weighing over 100 pounds.

The Bessemer Process.—It has been seen that Huntsman's invention gave to the world a method of producing, in a molten condition, steel of great purity and uniformity. The process, however, was relatively expensive, and, while it increased the consumption of steel, the use of that metal still remained confined to the manufacture of

relatively few costly implements, wrought iron continuing to be the metal employed for most purposes. The need, not of a purer steel, but of a steel lower in carbon, and which could be produced much more cheaply and in larger quantity, became more pressing as the building of railroads and bridges, of engines and machinery, of guns and armor plates, and of numerous other metallic structures steadily increased. This much needed metal was supplied in 1856 by the inventive genius of Henry Bessemer.

The Bessemer process consists in blowing air through molten pig iron, thereby producing a very rapid oxidation of the impurities and refining of the metal. The amount of heat resulting from this quick oxidation—that is, combustion—is so great that it is more than sufficient to maintain the bath of iron liquid even after practically the whole of the carbon has been burnt, and the melting point of the iron thereby considerably raised. In his first experiments, however, Bessemer found that while the metal could be decarburized to any desired extent, it was extremely hot short as well as cold short. In due time it was tried in Sweden with signal success, the steel being free from red shortness. Seeing that the Swedish pig iron used was rich in manganese, Robert Mushet suggested the addition of spiegeleisen or ferromanganese to the molten iron at the end of the blow, and by this addition all red shortness was removed. It is now well understood that in blowing air through molten pig iron not only the impurities (carbon, silicon, manganese) but a large amount of the iron iself is oxidized, and that much of the resulting iron oxide, failing to go to the slag, is retained by the iron, causing it to be red short. The manganese of the spiegeleisen or of the ferro-manganese combines with the oxygen of this oxide, reducing it back to the metallic state and thus removing the chief cause of red shortness. It was also ascertained that the cold shortness which was still frequent in Bessemer steel was due to the presence of an excessive amount of phosphorus, and it became evident that the phosphorus originally present in the pig iron could not be eliminated during the Bessemer blow. When iron sufficiently free from phosphorus was employed the cold shortness disappeared. It will be shown later that a modification of the process was afterward devised, by which phosphorus could be removed, so that high phosphorus pig iron can now also be converted into Bessemer steel of good quality.

The modern form of the Bessemer converter consists of a pear-shaped vessel made of an outer shell of iron or steel plates and lined with a thick layer of refractory material. At the bottom of the converter there is a 'wind box,' into which the blast is introduced and from which is enters the vessel through a number of small channels or 'tuyeres' provided for that purpose in the refractory lining of the converter's bottom. The vessel is so mounted that it can be rotated around its horizontal axis, which

makes it possible to run the molten pig iron into the converter while it is placed horizontally without danger of the metal running through the tuyeres and into the wind box. The blast is then started and the vessel placed in an upright position, the pressure of the blast now preventing the metal from running into the tuyeres. At the end of the blow the vessel is again rotated to a horizontal position, the metal clearing the tuyeres, and the blast is stopped. When ready to cast, the converter is further inclined and the molten iron run into a ladle, from which it is in turn cast into molds. The ladle into which the steel is poured at the completion of the blow consists of a tank made up of plates of steel and lined with refractory material, and capable of holding the entire charge of the converter, say from 5 to 15 tons of molten steel. At the bottom of the ladle a tap hole is provided, which can be closed or opened at will by a fire-clay plug whose motion is controlled by a lever attached to the outside of the ladle. In this way any number of molds may be filled in succession, the flow of metal into them being under perfect control.

Many improvements have been introduced into the blowing engines required to create the necessary blast, and the pressure and volume of air have been increased. Modern engines are constructed both horizontal or vertical, frequently compound and generally condensing; they deliver the air under a pressure of 20 to 30 pounds per square inch. Extensive and costly hydraulic machinery is necessary for the handling of the converter, ladle, molds, and ingots, a description of which, however, does not belong to the scope of this article. Tracks, cars, and locomotives are needed for the conveying of the molds and ingots, scales for the weighing of the converters' charges, ingots, etc., a fully equipped mill for the handling and preparation of refractory material, of converters' bottoms, etc., cupolas for the remelting of spiegeleisen, and, in some mills, of the pig iron, while in some other mills a large tank known as 'mixer,' soon to be described, is also needed. From this short outline of the required appliances to carry on the Bessemer process, it will be evident that Bessemer plants are very costly to erect, and that the investment, to be a profitable one, calls for a steady demand for the enormous output of such mill, which may amount to some 50,000 tons of steel per month in a 3-vessel plant.

American Bessemer plants generally consist of two or more converters of 10 to 15 tons capacity, and placed on one side only of the casting pit, nearly the whole of the pit being then available for casting purposes.

The reader being now familiar with the most important appliances making up a Bessemer plant, we may pass to a more detailed description of the operations and of the reactions involved in the process. Somewhat briefly stated, the early Bessemer practice was as follows: The pig iron

to be converted into steel was manufactured in the blast furnace in the usual manner and cast into sand-beds. The pigs were then remelted in 'cupolas' or small shaft furnaces placed in the vicinity of the converters, and from these the metal was run into a ladle, weighed, and the ladle emptied into a runner, which conducted the metal into the Bessemer vessel properly placed to receive it, or the ladle was conveyed to the converter and its contents poured directly into it, thus doing away with runners. The blast is then started, the vessel placed upright by the working of its rack and pinion gearing, and the blow continued until the person in charge, or 'blower,' judges that the operation has continued long enough, when the vessel is again turned to a horizontal position and the blast stopped. At this stage a weighed amount of spiegeleisen is run into the vessel through a gutter or by the direct tilting of the ladle holding it. Preheated fragments of ferro-manganese are sometimes added instead of spiegeleisen. It has been seen that the addition to the bath of these substances, rich in manganese, results in the reduction of the oxide of iron formed during the blow, and which, if allowed to remain in the metal, would cause it to be red short. These additions, moreover, also serve in introducing the desired amount of carbon into the steel, and finally, through the retention by the steel of some of the manganese, the metal can be more readily forged and some of the objectionable effects of sulphur are counteracted. The metal is now ready to be poured into the ladle, and from it into the molds, while the empty converter is placed horizontally, a new charge of molten cast-iron run into it with as little delay as possible, and the blowing resumed, so that in a 3-vessel plant there is always one converter blowing, and occasionally two. The tuyeres wear away quite rapidly and must be replaced by new ones as needed, while after a certain number of blows the whole bottom must be replaced by a new one, a number of which are always kept in readiness, and in modern mills this can be done very quickly through suitable mechanism. The life of the lining of the walls of the converters is of considerably longer duration, but these also must be repaired from time to time, and, at longer intervals, replaced by new ones. After the ingots have sufficiently solidified, the molds, which are bottomless, are removed by a crane, and the ingots, likewise lifted, placed on cars and conveyed to the rolling-mill, where they are converted by work and heat into finished or semi-finished products.

In recent years an important departure from the practice just outlined has been introduced in many Bessemer mills, consisting in running the pig iron produced by the various blast furnaces of the plant into a large tank known as 'mixer,' and from which the metal is taken as needed to the converters. In this way the pig iron is not allowed to solidify, and the cost of remelting is saved,

thus effecting a notable economy. This procedure possesses other advantages of too technical a character to be discussed here.

A still more recent improvement in Bessemer mill operation consists in doing away altogether with the casting pit by placing the molds on cars. After they have been filled they are at once taken to the rolling-mill, where the ingots are stripped, from which it will be apparent that the handling of the ingots from the pit to the cars is done away with.

The reactions taking place during the Bessemere blow have already been alluded to. By forcing a blast of air through a molten mass of pig iron the tendency will be for the oxygen of the air to combine with all the elements present, namely, with silicon, carbon, manganese, sulphur, phosphorus, and iron itself, and in order to form an accurate conception of the nature of the chemical reactions taking place it will be necessary to examine briefly the action of atmospheric oxygen upon each of these elements under the conditions prevailing in the converter.

Silicon is the most readily oxidized of the elements present. As soon as the blast is forced through the molten bath it begins to combine with oxygen, being converted to silica (SiO_2), and this silica now combines with some oxide of iron also produced at that time, being thereby converted into a silicate of iron ($FeO.SiO_2$) or slag. This rapid combustion of the silicon generates a great amount of heat, and, since the product of this combustion is a solid substance, the resulting heat is imparted nearly in its entirety to the molten iron, greatly increasing its temperature. It is essentially upon the combustion of the silicon that the process depends for the production of the necessary heat to maintain the bath liquid in spite of the enormous amount of cold air forced through it. Silicon, therefore, may be truly said to be the fuel of the Bessemer process, hence the necessity of having a sufficient amount of this element in the pig iron, lest we lack the necessary heat for the successful conduct of the operation.

Next to silicon, manganese is the most oxidizable of the elements present. It is converted into an oxide (MnO), which, combining with some silica, is absorbed by the slag as a silicate of manganese ($MnO.SiO_2$). The combustion of one unit of manganese, however, generates considerably less heat than the combustion of one unit of silicon, and the former element is, moreover, generally present only in small proportions, so that it contributes to the necessary heat to a much smaller degree than silicon. After most of the silicon and much of the manganese have been oxidized, the carbon begins to burn, mostly to carbon monoxide (CO), because the temperature within the converter soon becomes too high for the existence of carbon dioxide (CO_2). This carbon monoxide is carried away with the other gases, and, upon reaching

the mouth of the converter and coming in contact with additional atmospheric oxygen, burns to carbon dioxide, with the characteristic flame of that reaction. While this combustion of the carbon generates considerable heat, but a relatively small amount of it is available for increasing the temperature of the molten bath, because the products of this combustion, being gaseous, are carried away, imparting but a small amount of their heat to the bath.

So great is the tenacity with which sulphur clings to iron that but little, if any, of this constituent is eliminated in the Bessemer blow. Special additions and processes have been suggested for the removal of sulphur in the refining operation, but none has proved a signal success. In order to produce steel containing little sulphur, it is, therefore, generally necessary to employ pig iron containing but a small amount of that impurity.

In coming in contact with atmospheric oxygen, the tendency of the phosphorus is to be oxidized to phosphoric acid (P_2O_5). In order to expel this acid substance from the bath, however, it is now necessary to provide a base to unite with it, such, for instance, as oxide of iron (FeO), with which it would form a phosphate of iron ($FeO.P_2O_5$) and be absorbed by the slag. Failing in this, the phosphoric acid, if any has been formed, in the presence of metallic iron and because of the high temperature, will again be reduced to the elementary state, and reabsorbed by the metal. It is apparent, therefore, that in order to eliminate the phosphorus it is necessary to provide a base with which phosphoric acid may unite. Silica, however, has more affinity for the bases than phosphoric acid, and this will prevent the slagging of the latter so long as there is any free silica present. If it be further considered that the Bessemer converter described in the preceding pages is lined with 'ganister,' a highly silicious substance, it will be seen that an unlimited amount of silica is present, which will seize all available bases, leaving none to combine with the phosphoric acid. This explains why phosphorus cannot be removed in a furnace lined with an acid lining, a fact which at one time came very near causing the abandonment of the Bessemer process. To produce steel containing little phosphorus in a converter lined with a silicious substance it is necessary, therefore, to use pig iron containing little of that impurity, and, as it is generally accepted that steel of fair quality should not contain over 0.1 per cent phosphorus, it follows that the pig iron employed in its manufacture should not contain a greater amount of that element. Such pig iron is known as Bessemer pig iron, and in order to obtain it it is generally necessary that the iron ore should not contain over 0.05 per cent of phosphorus, when it is known as Bessemer ore.

It will soon be shown that a modification of the Bessemer process was later introduced, by which the phos-

phorus could be eliminated, and which, from the character of the lining of the converter, is known as the basic Bessemer process, the original process being for similar reasons called the acid process.

In American practice a Bessemer blow does not generally last over 10 minutes, and occasionally only 7 or 8 minutes. To make such short blows possible (and therefore greatly increase the output of the mill) it is necessary that all auxiliary operations be conducted very rapidly so that the converters, ladles, etc., be always kept hot, thus decreasing the amount of fuel, that is, of silicon, needed, which in turn means a shorter blow, since there is less silicon to burn. Under these conditions a silicon content of some 0.75 per cent is frequently sufficient.

The Basic Bessemer Process.—It has been shown why phosphorus cannot be expelled in a vessel with a silicious or acid lining. To remove the phosphorus the vessel must be lined with a basic refractory material, and for that purpose calcined dolomite mixed with tar is generally used. When conducting the Bessemer blow in such a converter and stopping the operation, as was customary, at the 'drop of the flame,' that is, when nearly all the carbon had been removed, the resulting steel was found to still contain a very large proportion of the phosphorus. To remove this element it was found necessary to continue the blow after this 'drop,' and this needed additional period is known as the 'after blow.' The two necessary conditions, therefore, for the elimination of phosphorus in the Bessemer converter are (1) a basic lining, and (2) an after blow. The complete solution of this important and difficult metallurgical problem was worked out in 1878 by Thomas and Gilchrist, two English metallurgists. In the basic blow some 15 to 20 per cent of well-burnt and generally preheated lime is added to the charge, in order to secure from the start a very basic slag, and also to avoid a too rapid destruction of the lining, which, but for this addition, would be called upon to furnish all the lime necessary for combination with the phosphoric acid. The slag of the basic process is much more abundant than in the acid process, and, consisting chiefly of a phosphate of lime, it is very valuable as a fertilizer, and it finds a ready market for such purpose. In the United States the supply of low phosphorus ores—that is, of Bessemer ore—is so abundant that it has not yet been found necessary to have recourse to the basic Bessemer process, there being at present no basic converter in activity. In Europe, on the contrary, and especially in Germany, where Bessemer ore is scarce, a large amount of steel is produced in the basic converter.

The Open Hearth Steel Process.—Before the invention of the open hearth steel process the Bessemer converter was the only metallurgical contrivance capable of producing steel of any desired carbon-content in a molten

condition. In 1861, but a few years after the Bessemer process had emerged from its experimental stage, Sir W. Siemens completed his invention of a furnace in which heretofore unattainable temperatures could be produced, and which was destined to make possible the second great modern process of steel manufacture. Brick chambers filled with checkers constitute the regenerative part of the furnace, there being a set of two chambers on each side of the furnace. In these chambers firebricks are placed, with some space between them so that when the gases are passed through them they come in contact with a very large area of brickwork. The working of these chambers is as follows: The gas used as fuel (generally producer gas), before entering the hearth of the furnace is made to pass through a chamber on the left, while the amount of air necessary to its combustion is made to pass through the other left chamber. Gas and air meet just before entering the hearth on the left and burn with a long flame, which is drawn, together with the products of combustion, through the hearth by a chimney draft. The intensely hot products of combustion, on their way to the chimney, are made to pass through the chambers on the right of the furnace, imparting to them a large proportion of their sensible heat. The next step will now be to return to the hearth, where it is needed, the heat thus stored up in the right chambers, and this is accomplished by reversing the direction of the currents of gas and air; that is to say, by causing the gas to pass through a chamber on the right and the air through another chamber, while the products of combustion now escape through the chambers on the left. In this way the gas and air are highly preheated before they meet, and the temperature of the furnace greatly increased. This in turn means that the products of combustion will be hotter and therefore that the left chambers will now be heated to a higher temperature than were the right chambers, so that at the next reversal of the gas and air currents a higher temperature still will be obtained in the furnace, and so on at each reversal, until the loss of heat by radiation will be equal to the increment of heat due to the reversal when the maximum temperature will have been reached.

In recent years a very important modification in the construction of regenerative furnaces has been proposed and very widely adopted. It consists in so supporting the hearth that it is entirely independent of the other parts of the furnace, and can be tilted, thus doing away with the necessity of a tap-hole, and presenting other advantages. Producer gas is the fuel generally used in regenerative furnaces. It is obtained by burning coal in deep fireplaces known as gas producers, with a limited amount of air, so that a partial combustion only is effected, the carbon being burnt to carbon monoxide and not to carbon dioxide. Producer gas, besides a large amount of inert nitrogen, contains also the hydrocarbons and other vola-

tile matters so abundant in bituminous coals. In modern gas producers, moreover, steam is generally admitted below the grates, as well as air, and through its decomposition hydrogen is introduced into the gas and notably increases its calorific power. The use of steam, moreover, prevents to a certain extent the formation of clinkers, and therefore facilitates the cleaning of the grates. In Pittsburg and its vicinity natural gas (composed essentially of marsh gas, CH_4) has been and still is widely used in regenerative furnaces, and its abundance in that district has been a powerful factor in the growth of Pittsburg into the greatest steel-making centre in the world.

The operation generally conducted in the regenerative furnace consists in melting pig iron, frequently mixed with some iron or steel scrap (so as to reduce the percentage of carbon and silicon to eliminate), under the oxidizing action of the flame, and generally in adding, when the charge is melted, a certain amount of ferric oxide, usually in the form of iron ore, so as to hasten the oxidation of the remaining carbon.

The first successful experiments in the manufacture of steel in the Siemens regenerative furnaces was conducted at Sireuil, France, in 1863-5, by Emile Martin, a French metallurgist, and on the continent of Europe steel produced in this furnace is frequently called Martin or Siemens-Martin steel, while in England and in America it has come to be universally known as open hearth steel. Mr. Martin's method consisted essentially in melting and refining pig iron mixed with iron and steel scrap. Siemens himself gave his attention to the production of steel in his furnace, and inaugurated the use of iron ore to hasten the oxidation of the carbon. The conduct of the operation as now generally carried on in the open hearth furnace consists in charging, in suitable proportions, solid pig iron and iron or steel scrap, although in some special processes liquid pig iron is sometimes treated. After the charge has been melted, it generally contains but a small amount of silicon and manganese, these two elements having been removed to a considerable extent during the melting period by the oxidizing atmosphere of the furnace, but it still contains a considerable amount of carbon. It is at this stage that iron ore or iron oxide in some other form is added to the bath in small installments so as to promote the removal of the carbon, bringing the molten metal to the desired degree of carburization. When high carbon steel is being manufactured, the operation is usually ended when the desired amount of that element remains in the bath; while for the production of lower carbon steel, it is more customary to decarburize the metal quite completely and to depend upon the addition of ferro-manganese or of some other carburizer to secure the needed percentage of carbon. In either case some ferro-manganese is added in order to introduce a desirable amount of manganese, the bene-

ficial effect of which has been mentioned when describing the production of Bessemer steel. When the operation is completed the tap-hole is opened (or the furnace tilted in case a tilting furnace is used) and the whole charge run into a ladle, similar, but generally larger, than the one used in the Bessemer steel process, and from this ladle cast into ingots in the usual manner.

The Basic Open Hearth Process.—Neither phosphorus nor sulphur are removed in the open hearth process just outlined, for reasons exactly similar to those preventing the elimination of these impurities in the acid Bessemer process. In order to remove the phosphorus the lining of the open hearth furnace must be basic, this modification of the process being then known as the basic process, and the original one as the acid process, and the products, respectively, as basic and acid steel. The most important difference between the conduct of the operation in a basic and in an acid furnace consists in the addition of lime to the bath when making basic steel, so as to secure at once a basic slag, that is, one capable of absorbing phosphorus, and also to prevent too rapid a destruction of the lining of the furnace, which would otherwise be called upon to furnish all the base needed for combination with the phosphoric acid formed. It will be understood that in the basic process pig iron containing any amount of phosphorus may be converted into steel very low in phosphorus and otherwise of good quality, while in the acid furnace only low phosphorus pig iron can be treated. The basic open hearth process has found much favor in the United States, over 86 per cent of the total open hearth steel produced being manufactured in the basic furnace. In England, on the contrary, the production of acid open hearth steel far exceeds that of basic steel.

Steel Castings.—Over 95 per cent of the steel manufactured by the processes outlined in the preceding pages is cast into ingots, which are then converted into finished implements, chiefly by mechanical pressure (rolling, forging, drawing), and it is quite natural that early efforts should have been made to cast the metal into finished shapes, thus doing away with its subsequent rolling or forging and greatly reducing, if not completely eliminating, the great amount of additional tooling required in many instances. Such method is especially of value for the manufacture of implements of intricate shape, such as could not be obtained, even roughly, by forging or rolling, and which therefore would necessitate an excessive amount of tooling. It is quite obvious, on the other hand, that for the manufacture of articles of simple, uniform, and relatively small cross-section, such, for instance, as rails, plates, beams, and structural shapes in general, the casting process, even if it yielded implements of as good quality, would be much more costly.

The first steel castings made greatly lacked soundness, due to the presence of numerous small internal cavities,

known as 'blow holes,' and resulting from the escape of gases while the metal is solidifying; but in recent years this very serious defect has been quite satisfactorily overcome, thiefly through the judicious addition of aluminum, manganese, and silicon, and through a better control of the temperature of the metal when cast. In cooling undisturbedly from the molten state steel assumes a coarsely crystalline structure, which greatly decreases its ductility and otherwise injures it. In order to refine the structure and thereby greatly improve the castings, they should be annealed, that is, carefully heated to a certain critical temperature for a certain length of time. Sound steel castings treated in this way may exhibit physical properties resembling closely those of steel forgings.

Steel castings may be manufactured by any of the three methods outlined in this article. While the crucible process, however, is well adapted to the production of finished castings, its relatively great cost must confine the use of crucible steel to the production of high grade, costly castings.

It will be obvious that the ordinary Bessemer plant cannot economically be employed for the manufacture of castings because of its enormous output, which could not be taken care of in this way, while the practice of turning into castings a portion only of the output is open to serious objections. When Bessemer steel castings are desired, small Bessemer converters of the Robert or Tropenas type are generally employed because by their use a much smaller output is obtained; while in favor of the small Tropenas vessel, the serious advantage is claimed of delivering the steel much hotter than is possible with the ordinary vessel. In these small converters some ferro-silicon is sometimes added at the drop of the flame, and the blowing resumed, the combustion of the silicon producing a very high temperature.

The open hearth process is well adapted to the manufacture of finished castings of all grades.

Special Steels.—During the last decade many steels have been manufactured and some of them widely used, which contain besides carbon and the other usual elements, a notable proportion of one or more metals, such as nickel, manganese, chromium, tungsten, molybdenum, etc. It will suffice to mention here (1) nickel steel (containing from 2 to 5 per cent nickel) which combines in a remarkable degree much ductility with high tenacity and especially with high elastic limit, (2) manganese steel (containing from 12 to 14 per cent of manganese), discovered by R. A. Hadfield, and which although very tough and ductile is so hard that it cannot be machined, (3) self-hardening or Mushet steel, containing a large proportion of tungsten and which unlike ordinary carbon steel becomes intensively hard when allowed to cool slowly from a high temperature, and (4) so called 'high-speed' steel, introduced by White and Taylor at the Bethlehem Steel Company, which contain a large amount

of chromium and tungsten or of chromium and molybdenum and possess the remarkable and invaluable property, when made into tools, of retaining their cutting edge even when the speed is such and the friction so excessive that the tool becomes heated to a dull red heat.

The following statistical figures will illustrate the remarkable growth of steel manufacture in the United States. The figures represent tons of 2,240 pounds:

Year—	Bessemer steel.	Open hearth steel.	Crucible and all other steels.	Total steel production.
1810.....	.....	.....	.....	917
1860.....	.....	.....	.....	11,838
1867.....	2,679	.....	16,964	19,643
1870.....	37,500	1,339	29,911	68,750
1880.....	1,074,262	100,851	72,222	1,247,335
1890.....	3,688,871	513,232	74,968	4,277,071
1900.....	6,684,770	3,398,135	105,424	10,188,329
1901.....	8,713,302	4,656,309	103,984	13,473,595
1902.....	9,138,363	5,687,729	121,158	14,947,250
1903.....	8,592,829	5,829,911	112,238	14,534,978
1904.....	7,859,140	5,908,166	92,581	13,859,887

The total world's production of steel in 1903 was 35,846,000 tons, so that the United States production in that year represented over 40 per cent of the world's production.

STEELE, Sir Richard: 1672-1729, Sep. 1; b. Dublin. His father, secretary to the Duke of Ormond, was of English family; his mother was Irish, and from her the son appears to have inherited the impulsive ardor, tenderness, bright fancy, and reckless profusion immemorially ascribed to the Irish national character. He was educated at the Charterhouse School, with his illustrious friend Addison, and thence was removed to Merton College, Oxford. Leaving college without taking a degree, he enlisted in the horse guards, for which imprudence he was disinherited by a rich relation of his mother, who had named him as heir to an estate in Wexford. In the army he rose to the rank of captain, but was gay, thoughtless, and dissipated—always sinning and repenting, as he himself confesses. To impose a check on his irregularities, he wrote a religious treatise, *The Christian Hero*, published 1701, the design of which was to show that no principles but those of religion are sufficient to make a great man. This public profession of seriousness had little effect on the volatile captain, and he next took to writing comedies. In 1702 he produced *The Funeral, or Grief à la Mode;* in 1703, *The Tender Husband;* in 1704, *The Lying Lover*—the last a failure. About the same time he obtained some fortune by marrying a West Indian lady, who survived the marriage only a few months; and 1706 he got the appointment of gazetteer, with a salary of £300 per annum, and also the post of gentleman usher to Prince George, which added another £100 to his income. In the following year (1707, Sep. 9) he married a Welsh lady, Mary Scurlock, who figures

conspicuously in his correspondence as the 'Dearest being on earth,' Dear Prue,' and 'Dear wife,' to whom he addressed about 400 letters—admiring, apologetic, and passionate. A course of extravagance—town and country houses, horses and chariots—soon involved the pair in difficulties. Mrs. Steele had a fortune of £400 a year, and was thrifty; but the lady's mother had a life-interest in the estate, and was hard and uncongenial. Addison gave a loan of £1,000, which was repaid within a twelvemonth; but he made other advances, secured by a bond on house and furniture. He put the bond in execution, sold the house and furniture, and remitted the surplus to his imprudent friend. For this seeming harshness Addison has been blamed; but it rests on good authority that the sufferer himself entertained no such feeling: he regarded the incident as a warning meant to do him service, and he met his friend again with his wonted composure and gayety. In 1709 S. commenced *The Tatler*, a periodical published thrice a week, containing short essays on life and manners, town-gossip or *tattle*, and articles of foreign and domestic news; for which S.'s appointment of gazetteer furnished him with peculiar facilities. Addison joined cordially in this publication, and still more effectively in its successor, *The Spectator*, a daily literary journal of higher tone, which was continued with unexampled success through 635 numbers. A third miscellany of the same kind, *The Guardian*, was extended to 175 numbers. S. afterward attempted other periodicals, *The Lover*, *The Reader*, etc., but these were short-lived. His fame rests on his essays in the *Tatler*, *Spectator*, and *Guardian*, to which he contributed respectively 188, 240, and 82 papers. In the keen political strife of that venal age, S. fought courageously and honestly for the Hanover succession and whig principles. He lost his office of gazetteer, and was expelled from the house of commons, for writing a pamphlet called *The Crisis*, in which he warned the nation that the Protestant cause was in danger. But when Queen Anne died, and the whigs were again triumphant, S. participated in the royal favor. He obtained an appointment in the king's household, was elected M.P. for Boroughbridge, and received the honor of knighthood. In 1717 S. was nominated one of the commissioners for the forfeited estates in Scotland, and he seems to have made four annual visits to Edinburgh on the business of this commission. He was led into a controversy with Addison, a few weeks before Addison's death, on the once-famous Peerage Bill—a proposal by ministers for restraining the king from any new creation of peers, except on the extinction of an old family. On this question S. took the side of the crown, and fairly beat his opponent in argument and in temper, besides enjoying the triumph of seeing the bill thrown out. The friends, alas! met no more. The survivor struggled on among controversies, embarrassments, and lawsuits; he was patentee of Drury Lane Theatre; and 1722 he produced his admirable and successful comedy of *The Conscious Lovers*. His health now rapidly failed. His wife had died

1718. He had children to solace his decline. His last three years were spent in retirement in Wales, and he died at Llangunnor, near Carmarthen.

The essays of S. have eclipsed his dramas. His Bickerstaff, the Spectator Club, allegories, and short tales have the true, ever-living, dramatic spirit. In taste and delicate humor, he was greatly inferior to Addison; but in invention and insight into human character and motives, he was fully his equal. He knew the world better, and he sympathized with almost every phase of life and character except meanness and cruelty. He seems to have considered it his special mission to reform the minor vices and absurdities of English society. If his satire had been more keen and trenchant, or his moral lessons more formal and didactic, he could not have succeeded as he did; his essays were just adapted to the times—they insinuated morality and benevolence, and supplied innocent enjoyment mingled with instruction. The lively, natural writer and companion is never lost in the teacher, nor the gay captain of horse wholly absorbed in the author.

STEELL, *stēl*, Sir JOHN, R.S.A.: Scottish sculptor; 1804–1891, Sep. 15; b. Aberdeen; son of a carver and gilder in Edinburgh. He received his education as an artist at the Edinburgh Acad., and at Rome. In 1832, he modelled a fine group of *Alexander and Bucephalus*, which, 50 years afterward, was cast in bronze, and was erected in Edinburgh 1884. The promise of this early work he fulfilled; and has a place in the front rank of his profession. His chief works are in Edinburgh: the colossal figure of the queen crowning the front of the Royal Institution; the statue of Walter Scott in the Scott monument, a commission won in competition; the equestrian statue of the Duke of Wellington (1852); statues of Prof. Wilson, and of Allan Ramsay (1865); and the equestrian statue of Prince Albert, at the inauguration of which, 1876, S. was knighted.

STEELTON, *stēl'ton:* town in Dauphin co., Penn.; on the Pennsylvania and the Philadelphia and Reading railroads; 3 m. e. of Harrisburg. Its nucleus was the Pennsylvania Bessemer steel-works, around which a thrifty community soon gathered. In 1866 a town was laid out, named first Baldwin, then Steel-Works, and, on its incorporation 1880, Steelton. In 1867 the manufacture of steel ingots was begun, 1868 a rail-mill was completed, 1872 the erection of blast furnaces was begun, 1876 a blooming-mill was finished, and since then the works have been developed till they have become the largest of their kind in the country. The town has several churches, a model graded public school, and 3 weekly periodicals. Pop. (1890) 9,250; (1900) 12,086; (1910) 14,246.

STEELYARD, n. *stēl'yârd*, colloq. *stīl'yerd* [from *steel* and *yard*]: balance for weighing bodies, consisting of a single weight shifted forward and backward on a graduated beam: see BALANCE.

STEEN, v. *stēn* [AS. *stán*, a stone]: in *arch.*, to line with dry brick, stone, or other material, as a well or cesspool: N. a brick or stone wall, or the lining of a well. STEEN'ING, imp.: N. the act of building with bricks or stones without mortar in the lining of wells, etc. STEENED, pp. *stēnd.*

STEEN, *stān*, JAN HAVICKSZ: Dutch painter: 1626–79; b. Leyden, where his father was a brewer. His early predilection for art led to his being apprenticed to a German painter, Nicholas Knupfer of Utrecht. Subsequently he became a pupil of Van Goyen, whose daughter Margaret he married. Very soon his repute became established. As he worked in a slow and elaborate manner, his gains were insufficient, and he started a brewery at Delft. This enterprise promised fairly; but, according to tradition, he was not of steady business habits, and became so affected with his own beer that soon he brewed no more of it. Little is known regarding his subsequent life, though many unauthenticated anecdotes are current which present him as a drunkard; but a late biographer, Van Westrheene, throws doubt on all such statements, which are indeed scarcely credible in view of his industry. His catalogued works number nearly 500. His death left his family destitute.

As an artist of the Dutch school he ranks high; and his works are now much valued. In humor and spirit they are scarcely surpassed; and their coloring is clear, fresh, and delicate. At times he attempted historical subjects, in which his success was not great. It was in homely and domestic scenes that his genius showed itself; in this field he has scarcely been equalled.

STEEP, v. *stēp* [Icel. *steypa*, to throw down, to pour out: Sw. *stöpa*, to steep, to sink]: to soak in a liquid; to imbue: N. the liquid in which a thing may be soaked; that which is soaked in a liquid; a rennet-bag. STEEP'ING, imp.: N. the process by which anything is soaked in a liquid. STEEPED, pp. *stēpt:* ADJ. soaked in a liquid. STEEP'ER, n. *-ĕr*, one who or that which steeps; a vessel in which things are steeped.

STEEP, a. *stēp* [Icel. *steypa*, to cast or throw down: Sw. *stupa*, to incline, to lower: Norw. *stup*, a steep cliff]: ascending or descending with a great inclination or slope; precipitous: N. a hill, mountain, or rock having a great inclination or slope. STEEP'LY, ad. *-lĭ*, in a steep manner. STEEP'NESS, n. *-nĕs*, the state of being steep or precipitous. STEEP'Y, a. *-ĭ*, having a steep or precipitous declivity. STEEP-DOWN, a. deep and precipitous. STEEPEN, v. *stēp'n*, to become steep. STEEPENING, imp. *stēp'nĭng*. STEEPENED, pp. *stēp'nd*. *Note.*—The two preceding entries are closely connected. 'The sense of *soaking* is incidental to that of *dipping*, and from the idea of *dipping* or *tumbling* to that of *steepness* or *abrupt inclination* is an easy step'—see Wedgwood.

STEEPLE, n. *stē'pl* [AS. *stypel*, a tower: Sw. *stapel*, a heap, a pile: Norw. *stupel*, a clock-tower: Low Ger. *stipel*, a prop, a pillar]: tower and spire, lantern, or other superstructure attached to a church, or other public building; a spire. STEEPLED, a. *stē'pld*, furnished with a steeple. STEEPLE-HOUSE, in *OE.*, contemptuous name for a church.

STEEPLECHASE, *stē'pl-chās*: race on horseback, not on a prepared course, but across fields, hedges, ditches, and obstacles of every kind that may happen to be in the way. The name and practice both are said to have originated in England in a party of unsuccessful fox hunters, on their return home, agreeing to try a race toward the steeple of a village church, the first who could touch the church with his whip to be the winner. This kind of sport soon became popular; and matches were made and sweepstakes entered into—the requirements of the course being simply two flagstaffs placed about two miles apart, from one of which the competitors started, made their way to the other, and returned to the starting point. Each rider was allowed to go and come as he chose, but the country was often selected on account of its difficulty; high and strong fences, deep and broad ditches, sometimes even swollen rivers having to be crossed and recrossed. About the end of the 18th c. was developed the more regular steeplechase of modern times over a course marked out by flags, between which the rider must pass to win the race; and 1841 *handicapping* began. This consists in weighting of horses according to their supposed merits, without reference to age, size, or sex. The first handicap steeplechase was run at Newport Pagnell, 1841, April 20; and the sport has since become increasingly popular in England, most of the spring and autumn meetings having their steeplechases for valuable stakes. Great crowds are drawn by the danger of the sport. Serious accidents are not rare; and great courage, coolness, resolution, and judgment are requisite in the rider.—The name is applied also to similar races for men. STEEPLECHASER, rider in a steeplechase; horse trained for such riding.

STEE'PLE-JACK, n.: man who climbs steeples and tall chimneys to effect small repairs, or to erect scaffolding.

STEER, v. *stēr* [AS. *styran*, to move, to stir: Icel. *styra*, to guide, to steer: *staurr*, a stake or pole: Dut. *sturen*; Dan. *styre*; Ger. *steuern*, to steer: Gael. *stiuir*, to guide, to steer]: to direct; to guide; to direct and govern the course of a ship by the helm; to be directed and governed; to pursue a course. STEER'ING, imp.: N. the act of directing a ship in its course by the helm. STEERED, pp. *stērd*. STEERAGE, n. *stēr'āj*, the steering of a ship; the manner in which a ship answers to the helm; the forepart of a ship, and the cabin there situated, for passengers paying a lower rate of fares. STEER'ER, n. *-ér*, one who steers. STEERAGE-WAY, that degree of forward movement which renders a ship governable by the helm. STEERING-WHEEL, the wheel by which a ship's rudder is turned and the ship steered. STEERSMAN, n. *stērz'măn*, one who steers a ship. —*Steering* in large steam-vessels is now done largely by aid

machinery. Various steam-steering engines have been invented and have received more or less extensive application. The general theory involves the use of a steam-engine without dead-point to rotate the rudder shaft, and the motions of the engine are controlled by a hand-steering wheel. It is obvious that if the steering-wheel opened or closed an ordinary steam throttle-valve there would not be connection between the number of degrees of rotation given it and the motion of the engine and rudder. The desired interdependence of these motions has been obtained in various ways. In Sickel's steam-steering apparatus, introduced 1860, the slide-valves are worked by eccentrics carried and fixed on a special disconnected shaft. This shaft is turned by the steering-wheel, so that each revolution of the eccentric shaft produces one revolution of the engine. In Jos. P. Manton's and in G. W. Baird's apparatus the motion of the engine is caused to actuate mechanism, differing in detail in the two machines, for automatically cutting off the steam. The steering-wheel if turned admits steam; the engine then rotates, and as it does so, gradually cuts off steam and comes to rest. Any desired ratio between the amount of engine motion and movement of steering-wheel can thus be secured. The other general features of steam-steering engines are the use of two cylinders inclined to each other to avoid the dead-point, and some quick means of disconnecting the steam-apparatus and returning to the ordinary mechanical or hand-steering process if desired: the latter feature provides for accident to the more or less delicate steam-gear. In war-ships the steering arrangements are kept as far as possible below the water-line. The use of steam-steering gear greatly contributes to the facility of working a vessel. On the U. S. monitor *Roanoke* it took two men two minutes to move the rudder from one extreme position to the other, with 19 revolutions of the wheel. With steam-gear one man with three and one-half revolutions ot the wheel wrought the same evolution in five seconds. In enabling larger rudders to be used, and by the steam cushioning provided by the normal steam-piston and cylinder action, the improvement is very marked.

STEER, n. *stēr* [Gael. *stair*, noise, confusion (see STIR)] in *Scot.*, confused noise; disturbance; tumult.

STEER, n. *stēr*, or STIRK, n. *stérk* [Bav. *ster*, the male sheep or hog: Gael. *stuir*, a male calf: Dut. and Ger. *stier*, a bull: AS. *styric*, heifer]: a young castrated male of the ox kind; a young bull or ox.

STEEVE, n. *stēv* [probably a corruption of STAFF or STAVE, which see: O. Dut. *steve*, a staff]: among *seamen*, the angle which a bowsprit makes with the horizon, or with the line of a vessel's keel; a long heavy spar with a place to fit a block at one end, used in stowing cargo closely together: V. to elevate at an angle with the horizon, or with the line of a vessel's keel; to make such an angle. STEEVING, imp.: N. the angle of elevation which a ship's bowsprit makes with the horizon. STEEVED, pp. *stēvd*.

STEEVENS, *stē'venz*, GEORGE: critic and editor of Shakespeare: 1736, May 10—1800, Jan. 22; b. Stepney, then a London suburb. He was educated at Eton School and at Cambridge. He published (4 vols. 1766) *Twenty of the Plays of Shakespeare, being the whole Number printed in Quarto during his Lifetime;* and was associated with Dr. Samuel Johnson in preparing the edition of Shakespeare's plays published 1773. Later Steevens, in association with Isaac Reed, issued 2 new editions, 10 and 15 vols., respectively: thus was the standard of Shakespeare's text fixed for at least 50 years. After his death his library, parcelled in 1,943 lots, was sold at auction for about $13,500 (£2,740).

STEG, n. *stĕg* [Icel. *steggr*, a male in general (see STAG)]: in *prov. Eng.*, a gander.

STEGANOGRAPHY, n. *stĕg'a-nŏg'ră-fĭ* [Gr. *steg'ănos*, covered, concealed—from *stegō*, I cover; *graphō*, I write]: a mode of writing by a choice of characters, known only to the initiated, and which depends on no rule; the art of writing in cipher; the art of writing in shorthand.

STEGNOSIS, n. *stĕg-nō-sĭs* [Gr.—from *stegnŏō*, I make thick, I make costive]: constipation. STEGNOT'IC, a. *-nŏt'ĭk*, binding; constipating: N. an astringent.

STEG'OCEPHA'LIA: one of the primary divisions of the amphibia, sometimes considered as a sub-class, sometimes as an order, especially characterized by the great development of dermal or superficial bones on the dorsal surface of the head. Being totally extinct and consequently known only from their skeletal remains, many questions concerning their relationships remain open. Many of the stegocephali were of salamander-like form, with broad, flattened head; simple, weak paired limbs of the typical pentadactyl type and a more or less elongated tail. Some were lizard-like with stronger limbs. Some, like *Ophiderpeton*, lacked limbs and were serpentine in form. Many are known to have passed through branchiate larval stages and some, like the *Branchiosauridæ*, retained the gills throughout life. Many of the large labyrinthodonts had rudimentary tails and must have been somewhat frog-like in aspect. One remarkable form, the *Dissorophus multicinctus* from the Permian formation of Texas, is described by Prof. Cope as having borne an armadillo-like carapace on the back. The roofing bones of the head were numerous and covered the temporal fossa as well as the cranium. In some of the larger forms they were much sculptured and excavated for the accommodation of mucous canals. The large eyes were supported by a ring of sclerotic bones, found well developed at the present day only in the eyes of some birds. In the middle of the cranial roof between the two parietal bones was the conspicuous pineal foramen, supposed to have lodged a functional median eye. The

nostrils were situated near the tip of the snout and the internal nares in the anterior part of the palate. The base of the skull was imperfectly ossified, but there was a well-developed basi-occipital bone with usually two occipital condyles. This deficiency of bone was supplied by the large superficial parasphenoid. The lower jaw was complex and the occurrence of an infradentary bone is especially noteworthy. Teeth of a simple, conical, partly hollow form, or with the walls fluted or, as in the labyrinthodonts (q.v.), complexly folded, existed on the jaws and palate. The notochord generally persisted and the vertebræ consisted of mere bony shells or were better ossified and formed of alternating intercentra and pleurocentra supporting the hæmal and neural arches or were otherwise segmented. There was never more than a single sacral vertebra. Scapula, coracoid, clavicle and interclavicle, were always present in the shoulder girdle and traces of a sternum sometimes appear. Likewise an ischium, ilium and sometimes a pubis have been found on each side of the pelvis. Both fore and hind limbs were simple and salamander-like, the carpus and tarsus unossified in the smaller species and presenting all of the primitive elements with two or three centralia in *Archegosaurus* and other larger forms. Ribs were simple and never joined the sternum. Some forms like *Branchiosaurus* were covered with an armor of scales.

The stegocephali were the first vertebrates to leave the water and assume more or less completely terrestrial habits; they were the first whose limbs departed from the fin type and became pentadactyl; their nasal passages show that they breathed air and they probably had lungs; their teeth indicate a flesh diet, probably consisting chiefly of fish. Footprints of stegocephali are found in abundance in rocks representing the muddy shores of the Carboniferous Period, and remains of these creatures are found from the Lower Carboniferous through the Permian and in the Triassic in Europe and America. They are especially abundant in the Permian of Texas, from which many interesting forms have been taken. Palæontologists differ on the question of their origin, some considering them descendants of the Crossopterygians, others of the Dipnoans. Whatever their origin the stegocephali formed the starting point for all terrestrial and air-breathing vertebrates, probably first giving rise to primitive reptiles like the cotylosauria, becoming themselves extinct.

Consult: Credner, *Die Urvierfüssler Naturw. Wochenschrift* (Berlin, 1891); Cope, *American Naturalist* (1884); Woodward, *Vertebrate Palæontology* (Cambridge, 1898).

STEGOMYIA, n. [Gr. ατεγη=house, and γνία=fly]: a genus of the *Culicidæ* or mosquitoes closely related to *Culex* and represented by several species in tropical and sub-tropical parts of the world, one of which has become

of greater importance than almost any other mosquito outside of Anopheles, on account of its being the transmitter of yellow fever. It was formerly known as *Culex* mosquito, but owing to certain structural differences it and several of its nearest relatives were placed into another genus. It is now known as *S. calopus* (from the Greek καλος-pretty and πους-foot). It is more particularly an American species, although occurring with other closely related species on the eastern hemisphere. It may be readily recognized from other mosquitoes by the pure silvery-white markings of the body and tarsal joints. The cycle of its development from egg to adult is shorter by three or four days than that of most other mosquitoes. Its agency in the transmission of yellow fever was clearly and indubitably proven by the American commissions in Habana and Vera Cruz and afterwards by the French commission in Rio de Janeiro. The correctness of their experimental findings was fully demonstrated by the fact that the yellow fever epidemic in New Orleans in 1905 was controlled and stamped out solely by the crusade against this particular species. From the time a female first feeds on an infected patient, not less than twelve days must elapse before she can transmit the disease to another non-immune.

STEIN, *stīn*, CHARLOTTE ALBERTINE ERNESTINE VON: 1742, Dec. 25—1827, Jan. 6; b. Weimar: friend and correspondent of Goethe. She was daughter of court-marshal Von Schardt, and wife of Baron Friedrich von Stein. Her beauty was of character and manner rather than of person. The friendship with Goethe was very intimate from near 1775 to 1788, when he formed an attachment to a domestic, who afterward became his wife; but there was no utter alienation. His letters to her were published 1848, some of hers to various persons have been printed; also a tragedy by her in prose, entitled *Dido*, supposed to shadow forth her experience; but Schiller, writing 1787, speaks of her relations with the great poet as purely platonic, although she had received from him a thousand letters. She died at Weimar. See New York *Sun*, 1890, Jan. 26, for full biography.

STEIN, *stīn*, HEINRICH FRIEDRICH KARL, Baron VON UND ZUM: one of the greatest statesmen that ever conducted Prussian affairs: 1757, Oct. 26—1831, June 29; b. Nassau: of an old Rhenish-Franconian family. He studied at Göttingen 1773 to 1777, entered the service of Prussia 1778; and 1784 had risen to the head of the department of mines for Westphalia. In 1786 he visited England, and studied its institutions, which he much admired. He was appointed, 1797, president of the Westphalian chambers. In 1804 he entered the Prussian ministry as chief of the department of indirect imposts, taxes, manufactures, and commerce. In this capacity he effected important ameliorations, particularly by removing restrictions on internal trade; yet he found

himself incapable of modifying the policy that resulted in the French invasion and conquest. S., though politically and religiously conservative, was strongly opposed to bureaucracy and military despotism, while recognizing in the self-governing powers of communities and provinces the only practical guarantee of national liberty, yet, as a baron of the empire, he was hostile to the anarchic sovereignity of little states; thus his political position procured for him many adversaries and few friends. In 1807, he was dismissed from office by the king, and withdrew to his estate in Nassau; but the peace of Tilsit opened the eyes of his sovereign to the wisdom of S.'s policy, and in less than seven months he was recalled, with the approbation of Napoleon, who had as yet no idea of S.'s deep and earnest patriotism. S.'s industry was untiring. Seeing clearly that, in a military view, Prussia was powerless for the moment, he set about developing her internal resources by a series of administrative and political reforms, known as *Stein's System*—the principal of which were abolition of serfage, with indemnification to the territorial lords; subjection of the nobles to manorial imposts; equality of orders in the sight of the law; universal obligation of military service; promotion in the state by merit alone, without distinction of caste; and establishment of a municipal system analogous to that of England. Some of these reforms were carried out by S., and others by his successor Hardenberg (q.v.). Meanwhile, he had become suspected by Napoleon; and an intercepted letter from S. was brought to the French emperor, in which his policy was sharply criticised. S. was obliged to resign (1808), and retired to Austria, where he became the centre of a secret national society, the *Tugendbund*. Napoleon, who bitterly hated patriots that stood in his way, confiscated his property. In 1812, S. was summoned to Russia by Emperor Alexander, and contributed by his counsels to prepare the coalition against Napoleon. After the march of the allies into Saxony, he was appointed pres. of the council of all the German States; was a leader in all the military diplomacy of that stirring time till the congresses of Vienna and Aix-la-Chapelle, in which, however, he took no part, owing to the intrigues of the Bavarian minister, acting for the lesser states of Germany: those states knew well that S. did not look with a favorable eye on their anarchic autonomy. The absolutists also were against him. S. thereafter had some honorable functions, but no power, and died at Frücht. S. was the great forerunner of Bismarck —seeing afar through the mists which no other eye penetrated, both the need and the possibility of German unity, and tenaciously keeping his course thitherward.—See Pertz's *Leben des Freiherrn von Stein* (1855); Prof. Seeley's *Life and Times of S.* (1879). His correspondence with Humboldt, Gneisenau, Eichhorn, Niebuhr, etc., is extremely valuable for the political history of the period.

STEIN'BOK: see BOUQUETIN.

STEINITZ, *stī'nĭts,* WILHELM: chess-player: b. Prague, 1837, May 18; d. 1900, Aug. 12. He was educated in the schools of his native town and in the Polytechnicum at Vienna. At the Dublin Chess Congress 1865 he won the first prize, and 1866 beat the then champion, Prof. Anderssen, by winning 8 games out of 14: thus Steinitz became the chess champion of the world, a distinction which he retained until 1894 and had gained every single-handed match or series played from 1862, and either first or second place (or been tied for first or second) in every tournament in which he had played since 1867. His average score in tournaments had been the highest, and in any single one his score was always the best. Among the great chess-players with whom he had contended for the mastery were Blackburne, Bird, Zuckertort, Martinez, Mackenzie, Tschigorin, Golmayo, Vasquez, and Gunsberg. He came to the United States in 1883.

STEINMETZ, *stīn'mĕtz,* KARL FRIEDRICH VON: soldier: 1796, Dec. 27—1877, Aug. 4; b. Eisenach in Saxe-Weimar. Having passed through a military school, he entered the Prussian army as lieutenant 1813, and served in the wars against Napoleon, being several times wounded, and winning the order of the Iron Cross. In the street-fighting in Berlin 1848 Steinmetz commanded a regiment; he was commissioned colonel 1851, major-general 1854, lieutenant-general 1858; he was in command of an army corps (1862). In the Austro-Prussian war (1866) Steinmetz, commanding the Fifth corps, defeated 3 different Austrian corps in 4 days. In the Franco-Prussian war (1870-1) Steinmetz commanded the first army against Bazaine at Metz; but owing to dissensions between him and Moltke, as to the plan of campaign, etc., Steinmetz was superseded in the command, and named governor of Posen and Silesia. He was promoted field-marshal 1871, April 8. Steinmetz was harsh and testy of temper, but he was a faithful officer.

STEINWEHR, *stīn'wār,* ADOLPH WILHELM AUGUST FRIEDRICH, Baron VON: soldier: 1822, Sep. 25—1877, Feb. 25; b. Blankenburg, Brunswick, Germany. He was educated at the military academy of Brunswick. In 1854 he emigrated to the United States and at the beginning of the Civil war raised and was commissioned colonel of the 29th N. Y. regiment. 1864, Oct. 12, he was made brigadier-general of volunteers, and given command of the second division under Sigel and afterward under Howard. He was in the campaign on the Rapidan and Rappahannock and in the battles of Chancellorsville and Gettysburg. He died at Buffalo, N. Y.

STELA, n. *stē'lă* [L. *stēla,* a pillar—from Gr. *stēlē,* a post or slab]: a small column or pillar without base or capital, used as a monument, a milestone, etc. STELE, n. *stē'lē,* a sepulchral slab or column. STE'LENE, a. *-lēn,* used as a stela; columnar.

STELLAR, a. *stĕl'lėr*, or STEL'LARY, a. *-ĭ* [L. *stella*, a star: It. *stellare*, stellar]: starry; relating to stars; full of stars. STEL'LATE, a. *-lāt*, or STEL'LIFORM, a. *-lĭ-fawrm* [L. *forma*, a shape]: in *bot.*, resembling a star: arranged like a star. STEL'LATED, a. *-lā-tĕd*, radiated; resembling a star; having the fibres, crystals, or members diverging in all directions from a common centre. STELLED, a. *stĕl'ĕd*, in *OE.*, starry. STEL-LIF'EROUS, a. *-lĭf ėr-ŭs* [L. *fero*, I produce]: having or abounding with stars.

Stellate Leaves.

STELLA'RIA: see STITCHWORT.

STEL'LERINE: see RHYTINA STELLERI: also MANATIDÆ.

STELLIONATE, n. *stĕl'lĭ-ō-nāt* [L. *stellĭō* or *stellĭōnem*, a lizard, a knavish person]: in *law*, the fraudulent sale of a thing otherwise than it is; the fraudulent sale of the property of another as if it were one's own.

STELLITE, n. *stĕl'līt* [L. *stella*, a star; Gr. *lithos*, a stone]: a white translucent mineral of a silky appearance, occurring in stellar groups in greenstone.

STELLULÆ, n. plu. *stĕl'ū-lē* [dim. of L. *stella*, a star]: in *anat.*, a name given to any cluster of small veins or vessels which have a stellate arrangement. STEL'LULAR, a. *-ū-lėr*, shaped like little stars; having marks resembling stars.

STELVIO, *stĕl'vē-ō*, PASS OF THE (Ger. *Stilfserjoch*): highest carriage-road in Europe (9,176 ft. above sea-level); leading from Bormio, on the Italian side of the Tyrolese Alps near the head of the Valteline, to Glurns on the Austrian side. It forms part of the great road between Milan and Innsbruck, and was completed by the Austrian govt. 1828, at an expense of 3,000,000 florins. The boldness of its design, the difficulties of its construction, and the grandeur of its scenery make this the most remarkable road in Europe.

STEM, n. *stĕm* [AS. *stemn;* Ger. *stamm*, the stem or trunk of a tree: Dut. *stam*, a trunk, stem, stock: Dan. *stamme*, the trunk of a tree]: the body of a tree or plant from which the branches or offshoots grow: the stalk (see below): the stock of a family; race; progeny; in *music*, the line joined to the body of a note. STEM'LESS, a. *-lĕs*, without a stem.

STEM, v. *stĕm* [Icel. *stemma*, to stop, to close: Ger. *stemmen*, to stick something against an object with a sudden thrust: Dan. *stemme*, to stem]: to put a stop to; to resist; to make progress against, as a current. STEM'MING, imp. STEMMED, pp. *stĕmd*.

STEM, v. *stĕm* [Icel. *stefna* or *stemna*, to turn the stem toward: Norw. *stemna*, course, direction (see STEM 1 and 2)]: in *OE.*, to move in a certain direction; to steer: N. a number of ships coming at an appointed time; in *Cornwall*, an appointed task; a day's work. STEM'MING, imp. STEMMED, pp. *stĕmd*.

STEM, n. *stĕm* [Norw. *stemm,* the stem or prow of a vessel—same word as STEM 1]: the strong curved timber to which the two sides of a ship are united in front, the whole having a wedge-like appearance; the prow. This strong piece or combination of timber is scarfed to the fore end of the keel, and rises nearly perpendicularly to form the bow and cutwater: to it are rabbeted the fore-ends of the plants. It is backed by an equally strong timber called the Stemson, bearing the same relation to it as the Keelson (q.v.) to the keel (see SHIP-BUILDING). STEM, v. in *OE.,* to move forward as a ship with its stem. STEM'MING, imp. moving forward with the stem. STEMMED, pp. *stĕmd.* FROM STEM TO STERN, the whole length of a ship.

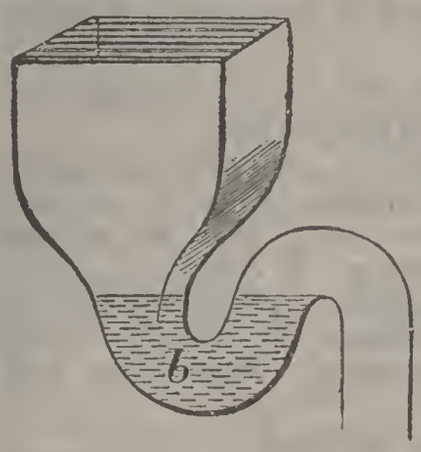
STEM, in Botany: that part of the plant which, arising from the surface of the ground, and shooting upward as the root shoots downward, bears the leaves and flowers. Stems are either single or branched. They are herbaceous or woody, solid or hollow, jointed or unjointed. Sometimes they are weak so as to be procumbent, though usually firm and erect; sometimes weak stems are twining or they are upheld in various other ways by the climbing habit of the plant. Stems are generally round, but sometimes compressed or angular. The arrangement of the leaves and branches, in reference to the stem, is symmetrical, but plants differ from each other in the nature of this arrangement. In the branching of trees, the symmetrical arrangement is often lost, as to the principal branches, by the death of some of them. In many plants the stem is obsolete, or so abbreviated as to be inconspicuous, forming a mere neck—the *crown of the root*—where the leaves and flower-stalks spring as at once from the root. Very important differences in the structure of stems distinguish the three great classes of plants—Acrogenous (q.v.), Endogenous (q.v.), and Exogenous (q.v.). Stems sometimes creep along the ground, or even under the ground, when they receive the name *rhizome* or *root-stock;* they can be distinguished from true roots, in most cases, by their joints, or by scales or scars of stems and leaves.

STEMBEL, *stĕm'bĕl,* ROGER N.: naval officer: born Md., 1810, Dec. 27; d. 1900. He became a midshipman in the navy 1832, and lieutenant 1843. During the Civil war he rendered important service at various points, commanded the *Cincinnati* in a desperate engagement 1862, and received commendation for both skill and gallantry. After the war he was connected with the European squadron. He was promoted commander 1861, captain 1866, commodore 1870, was retired 1872, and became rear admiral on the retired list 1874, June 5.

STEMMATA, n. plu. *stĕm'mă-tă* [Gr. *stemma,* a garland, *stemmăta,* garlands—from *stephō,* I encircle]: in *zool.,* the simple eyes or ocelli of certain animals, such as insects and spiders.

STEMPLES, n. *stĕm'plz* [a probable dim. of *stems* or *steps*]: in certain mining districts, pieces of wood fixed in the sides of the shaft by which an ascent or descent can be made.

STENCH, n. *stĕnsh* [OHG. *stinchan*, to smell sweet or bad: AS. *stenc*, smell: Ger. *stank;* Icel. *stækja*, a stench]: a strong bad smell; offensive odor. STENCH'Y, a. *-ĭ*, in *OE.*, having an offensive smell. STENCH-TRAP, in plumbing, a form of drain-opening, which, while allowing liquids to run down, prevents escape of noxious gases arising from sewers, etc. It is of iron or earthenware, in great variety of forms, but on one very simple principle, there being a curved or siphon pipe below the grating or grid (fig.), which always retains sufficient water, *b*, to prevent the outward passage of the gases. The water thus forms a 'seal.' It is absolutely imperative, for health, that each opening from a room into a drain or a sewer should have one—and generally more—of these fixtures.



Stench-trap.

STENCIL, n. *stĕn'sĭl* [probably from OF. *estinceller*, to sparkle, as given by Skeat (see TINSEL)]: thin piece of pasteboard or leather, or a thin plate of metal, in which the outlines of any figures are cut out, used to paint or mark in colors by passing a brush of color over it while lying on paper or placed against a wall—the plate shutting off the color from all but the spaces cut out: it is a rapid and cheap process in wall-decoration: V. to paint or ornament by means of a stencil. STEN'CILLING, imp.: N. the art; the work done. STEN'CILLED, pp. *-sĭld*. STEN'CILLER, n. *-sĭl-ĕr*, one who stencils.

STENDAL, *stĕn'dâl:* town of Prussian Saxony, 38 m. n.n.e. of Magdeburg. It has manufactures of woolens, cottons, tapestries, stoves, machinery, tobacco, gloves, etc. Pop. about 23,000.

STENO-, prefix, *stĕn-ō*, or STEN- [Gr. *stenos*, in a narrow compass]: small; narrow; confined; in a small compass.

STENO, *stā'nō*, NICHOLAS: distinguished anatomist and geologist: 1638–87, Nov. 25; b. Copenhagen. He had long been famed for his anatomical discoveries, when, 1667, he applied himself to geology, and has been regarded as the father of paleontological science. He lived much in Italy, and became a Rom. Catholic. Latterly he wrote several religious and controversial works, and was made a bishop *in partibus* by the pope. He died at Schwerin. See *Nature* xxv.

STENOGRAPHY, n. *stĕn-ŏg'rā-fĭ* [Gr. *stenos*, narrow; *graphō*, I write]: the art of writing very expeditiously by using simple signs and abbreviations; Shorthand (q.v.). STENOGRAPHIC, a. *stĕn'ō-grăf'ĭk*, or STEN'OGRAPH'ICAL, a. *-ĭ-kăl*, of or relating to stenography. STEN'OGRAPH'ICALLY, ad. *-lĭ*. STENOGRAPHER, n. *stĕn-ŏg'rā-fĕr*, or STENOG'RAPHIST, n. *-rā-fĭst*, one who is skilled in stenography; a shorthand-writer.

STENOPHYLLOUS, a. *stĕn-ŏf'ĭ-lŭs* [Gr. *stenos*, narrow; *phullon*, a leaf]: in *bot.*, narrow-leaved.

STENT, n. *stĕnt* [OF. *estendre*, to estimate—from mid. L. *extendĕrĕ*, to appraise, to estimate—from L. *ex*, out; *tendĕrĕ*, to stretch]: in *OE.* and *prov. Eng.*, an allotted portion; a limited right of pasturage; in *Scots law*, a valuation of property in order to taxation; in *Staffordshire*, the day's work of a miner: V. to stretch; to restrain; to estimate with a view to taxation; to assess. STENT'ING, imp. STENT'ED, pp.

STENT, v.: OE. for STINT or STINTED.

STENTORIAN, a. *stĕn-tō'rĭ-ăn* [*Stentŏr*, a herald mentioned by Homer who had a voice like thunder]: exceedingly loud and powerful—applied to the voice or lungs.

STEP, n. *stĕp* [Dut. *stap*, a step: Icel. *stappa*, to stamp: Russ. *stopa*, sole of the foot]: a forward movement made by one removal of the foot; the space so passed over; one rise of a stair or ladder; a print or impression of the foot; any small space or distance; degree; progression; manner of walking; proceeding; action; the hole or socket into which the end of a mast is inserted when placed upright: V. to make one pace, as in walking; to advance or recede by one movement of the foot; to walk; to go; to walk a short distance. STEP'PING, imp.: N. movement by steps. STEPPED, pp *stĕpt*. STEPS, n. plu. a portable flight of stairs, or a self-supporting ladder with flat steps. STEPPING-STONE, a raised stone in a swampy place or in a stream to save the feet in walking; any means of progress. TO STEP ASIDE, to walk to a little distance off; to remove but a little way; to err. TO STEP INTO, to walk or advance into a place or state. TO STEP A MAST, to raise it upright in its socket. TO TAKE A STEP or STEPS, to make a movement in a given direction. STEP BY STEP, by a gradual and regular process.

STEP-FATHER, n. *stĕp-* [OHG. *stiufan*, to deprive of parents: Icel. *stufr*, a stump; *styfa*, to cut short: O.Sw. *stubbe*, a stump; *stubba*, to cut short]: a father by marriage only. STEP-MOTHER, not one's own mother; a mother by marriage. STEP-BROTHER, a son of a step-father or -mother. STEP-CHILD, or STEP-DAUGHTER, and STEP-SON, the child of one's husband or wife by a former marriage. STEP-SISTER, the daughter of a step-father or -mother, etc.

STEPHANITE, n. *stĕf'ăn-īt* [after Archduke *Stephen* of Austria]: a valuable ore of silver of a dark or lead gray color, called also *black-silver*, occurring in prismatic or tabular crystals in veins in the older rocks.

STEPHEN, *stē'vĕn*, Bishop of Rome: (in office about 254–257), successor of Lucius I. His pontificate is memorable in the historical discussions as to the early evidences of a Roman *primacy*. The history of S. is urged as an argument by each party in support of its own view. The advocates of the primacy infer, from several examples of the deposition of bishops by S. in various places, that a power equivalent to the modern primacy of Rome was even then acknowledged. The adversaries of the primacy contend that the resistance to S. offered and maintained by Cyprian (q.v.), on the rebaptizing of heretics, is irreconcilable with the general recognition in the 3rd c. of any supremacy on the part of the bishop of Rome.

STEPHEN III., Pope of Rome: (pope 752–757); b. Rome; d. 757, Apr. [He is numbered in some lists as S. II.: such lists do not reckon the S. II. who died 752, Mar., four days after his election, and before his consecration.] His place is important in the history of the temporal sovereignty of the Roman see. He was in possession of the see during the occupation (which practically dates from 752) of Ravenna, the Exarchate, and the Pentapolis, by Astolphus, King of the Lombards. That king having invaded Rome, and the Byzantine emperor, Constantine Copronymos, having left unheeded the appeals of S. and the Romans for succor, S. had recourse to Pepin, King of the Franks. The latter in vain sent legates to Astolphus; and the pope returned to France with the legates to solicit in person the aid of the Frank monarch, whom he solemnly crowned. Pepin agreed to compel the Lombards to withdraw from these provinces (which formed the portion of the states formerly in occupation of the Roman see, known as the 'Legations'), and to bestow them on the see of Peter. The Lombard king made a promise to that effect; but on Pepin's withdrawal, renewed his pretensions, and marched on Rome. S. therefore recalled Pepin in a most curious letter written in the name and person of St. Peter, an invitation with which Pepin at once complied; and having again forced Astolphus to withdraw, he (notwithstanding a demand from the Byzantine emperor for the restoration of the provinces to the empire) reinstated the Roman see in its sovereign rights.

STEPHEN VII., Pope of Rome: (pope 896–7); d. 897. He has supplied to historians much matter of discussion, from his strange proceedings in disinterring the corpse of his penultimate predecessor, Formosus, stripping it of its pontifical garments, and ordering it to be thrown into the Tiber, as the body of a usurper of the papal throne. The popular tumult which this excited ended in S.'s imprisonment, and his death by strangling.

STEPHEN X., Pope of Rome: (pope 1057–8); d. 1058, Mar. 29. He was one of the remarkable series of reforming popes in the 11th c. who are believed to have been elected under the influence of the renowned Hilde-

brand, and who, by their energetic rule, prepared the way for that great scheme of ecclesiastical organization of which the pontificate of that eminent man, under the name of Gregory VII. (q.v.), was the final development.

STEPHEN, King of England: 1105–1154, Oct. 25 (reigned 1135–54); b. Blois; third son of Stephen, Count of Blois, by Adèle, or Alise, daughter of William the Conqueror; consequently nephew of Henry I., and cousin of Matilda, daughter of Henry. He was brought over to England at an early age, and became a favorite with his uncle, who bestowed on him large estates, and procured for him a marriage with Mahout, or Matilda, daughter of Eustace, third Count of Boulogne, and younger brother of the famous Godfrey of Bouillon. By this marriage S. inherited the earldom of Boulogne on the death of his father-in-law (1125), and became connected with the royal family of Scotland. When his uncle Henry resolved to settle the crown on his daughter Matilda, whose first husband was Henry V., emperor of Germany (whence she is often spoken of as 'Empress Maud'), he expected for his project the support of his nephew, and at a council in London, 1127, S., with the other dignitaries of the land, lay and ecclesiastical, took the oath of fealty to Maud. A few months later, the widowed empress married Geoffrey Plantagenet (q.v.). On the death of Henry I. (1135), S. hurried over to England from Normandy, where he had been with his dying uncle, and was soon surrounded by a powerful body of the nobles and clergy, and was crowned at Westminster. His usurpation was confirmed by a bull of Pope Innocent. But S. found his crown a crown of thorns. Although a gallant, generous, handsome prince, immeasurably superior in personal and royal virtues to Maud (who was suspected of having murdered her first husband, and who quarrelled with her second, and was altogether a fiery, insolent, unwise, and exasperating woman), yet on S. rests the responsibility of causing a civil war as sanguinary, if not as protracted, as the famous *Wars of the Roses*. Listen to the *Saxon Chronicle*: 'In this king's time, all was dissension and evil and rapine. . . . . Thou mightest go a whole day's journey, and not find a man sitting in a town, nor an acre of land tilled. The poor died of hunger, and those who had been men well-to-do begged for bread. . . . . This lasted the 19 years that Stephen was king, and it grew continually worse.' S., to conciliate the petty barons, allowed them to build castles, of which in all more than a thousand were erected—each a robber-haunt.

In 1141, Feb., after five years of fierce fighting—against David of Scotland, uncle of Maud, who had taken up arms for his niece (see STANDARD, BATTLE OF THE); against Robert, Earl of Gloucester, natural son of the late king Henry, who also had raised the standard of his half-sister; against individual nobles who simply wished to live in anarchic and barbarous independence;

and finally, against the power of the church, which he vainly sought to diminish—he was taken prisoner by the Earl of Gloucester, and placed in chains in the Castle of Bristol. Maud was now elected queen by her own party, but her rapacity and other bad qualities soon made her rule intolerable, and the wife of the imprisoned S. (also called Maud or Matilda) found it possible to continue the war, by the help of the Londoners, who were stanch adherents of her husband. S. obtained his liberty in exchange for the Earl of Gloucester, who had fallen into the hands of S.'s friends at Winchester; and the war was resumed with greater violence. The death of the Earl of Gloucester, 1146, forced Maud to take refuge in Normandy; but a conspiracy of nobles, headed by Ranulph, Earl of Chester, and another quarrel with the church, kept S.'s hands as full of work as before, and no sooner were these matters settled, than Maud's son, young prince Henry, appeared in England (1153) at the head of an army to support his claim to the throne. Fortunately for the nation, so sadly wasted and desolated, a compromise was effected between the two rivals, which prevented further bloodshed—S. agreeing to acknowledge Henry as his successor. S. died at Dover the year following.

STEPHEN, Sir JAMES FITZJAMES, K.C.S.I., D.C.L.: jurist: 1829, Mar. 3—1894, Mar. 12; son of Sir James S. and bro. of Leslie S. (q.v.). He graduated at Cambridge; was called to the bar 1854, recorder of Newark-on-Trent 1859–68, in the mean time winning great distinction as counsel for the Rev. Roland Williams, accused of heresy; legal member of the council of the gov.gen. of India 1869, Dec.—1872, Apr.: while in India he labored to consolidate, abbreviate, and simplify the laws; prof. of common law 1875–77; judge of the high court of justice 1879, resigning 1891. He was author of numerous treatises on law, and he wrote frequently for reviews, on so ial and political questions.—His father, Sir JAMES S. (1790, Jan. 3—1859, Sep. 15; b. London), was a barrister, and for many years was colonial sec., showing extraordinary activity, energy, and administrative ability. He was prof. of mod. history in Cambridge 1849 till his death. He wrote for the *Edinburgh Review* on church history and religious opinion. He was author of *Essays in Ecclesiastical Biography* (1849) and *Lectures on the Hist. of France* (1851).

STEPHEN, LESLIE, M.A.: essayist: b. London, 1832, Nov. 28; d. there 1904, Feb. 22: son of Sir James S. He was educated at Eton School, King's Coll. (London), and Cambridge; was for several years fellow of Trinity Hall, Cambridge; edited *Cornhill Magazine* 1872-82; and from 1882-91 was editor of the great *Dictionary of National Biography*. Among his separate publications are: *Hours in a Library* (3 series); *Free Thinking and Plain Speaking; English Thought in the 18th C.; Science of Ethics;* lives of several

English men of letters; Life of Henry Fawcett. He edited *Fielding's Works* (1882), adding a biographical essay.

STEPHEN, SAINT, THE DEACON: the protomartyr, or earliest of the Christian martyrs; one of the seven deacons named Acts vi., where his martyrdom, about A.D. 37, is recorded. His festival is one of those which accompany that of Christmas—Dec. 26 in the Latin Church. His relics were believed to have been discovered 415, the 'discovery' being commemorated by a festival held Aug. 3.—In the calendar of the Rom. Cath. Church are several other saints of the same name, of whom perhaps the most remarkable is Stephen, king of Hungary in the early part of the 11th c., who died 1038.

STEPHENS, *stē'vĕnz*, ALEXANDER HAMILTON, LL.D.: 1812, Feb. 11—1883, Mar. 4; b. Crawfordsville, Ga.: statesman. His father was a Penn. capt. in the revolution, removed to Ga., and left his son an orphan at 15, to be educated by a friend and by charity. Graduating at the Univ. of Ga. 1832 as the first scholar in his class, he began the practice of law two years later. Opposing nullification, and the lawless 'vigilant' proceedings then as now in vogue, he was nevertheless elected to the legislature 1836–40. His first speech there was notable as made for a state railroad (from Atlanta to Chattanooga). He became state senator 1842, and mem. of the U. S. house of representatives 1843, continuing until 1859. His first speech in congress, though he was a state-rights man and afterward opposed secession as inadvisable only, was remarkable as upholding the power of the general government to regulate states in matters pertaining to its own organization—the principle involved in recently stigmatized 'force-bills.' He opposed the Mexican war, but hailed its results. He advocated the compromises of 1850, and the same year was co-author of the 'Georgia Platform,' which held 'the American Union secondary in importance,' etc. In 1852, he refused to support Gen. Scott for the presidency, and united with the democratic party 1855. In 1859 he suggested in his Augusta speech the revival of the slave-trade, and in 1878 made a laudatory speech at the presentation of the *Emancipation Proclamation* picture. He acquiesced in secession after it was voted by his state, was member of the Confederate provisional and subsequent congress, and vice-pres. of the Confederacy, and 1865 chairman of committee in the Hampton Roads peace conference. After the war, he was imprisoned in Fort Warren, Boston, 5 months, and released on parole; elected U. S. senator 1866, under Pres. Johnson's proclamation, not recognized by congress; was in the 43rd–47th congresses; and was gov. of Ga. 1882–3. Of the Jeffersonian school in general, he was a man of striking inconsistencies (some of them more striking than real) in politics; but scholarly, earnest, independent, unfalteringly courageous, and an effective

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speaker, notwithstanding his physical ills and deficiencies. He published a school hist. of the U. S.; and *Constitutional View of the War between the States* (1867–70).

STEPHENS, ANN SOPHIA (WINTERBOTHAM): author: 1813–1886, Aug. 20; b. Derby, Conn. At the age of 18 she married Edward S.; soon removed to Portland, Me.; edited the *Portland Magazine* 1835–37; then removed to New York, where she was editor of the *Ladies' Companion* several years; was on the editorial staff of *Graham's Magazine* and *Peterson's Magazine;* and 1850 travelled in Europe and the East. Soon after her return she became noted as a novelist. Among her works were: *Fashion and Famine* (1854); *The Old Homestead* (1855); *The Rejected Wife* (1863); *The Reigning Belle* (1872); and a *Pictorial History of the War for the Union.* An edition of her works in 23 vols. was published 1886. She died at Newport, R. I.

STEPHENS, *stē'vĕnz* (Fr. ESTIENNE): noble Provençal family; distinguished as printers and publishers.

HENRI ESTIENNE (abt. 1470–1520), the founder, settled at Paris 1502; and carried on the business of printer and bookseller for more than 20 years.

ROBERT ESTIENNE (1503–59), second son of Henri, was in possession of the business 1526: he published (1528) his first Latin Bible, in folio. Every year of his life is marked by the issue from his printing-press of several volumes, many of them masterpieces of art, and all surpassing anything of the kind previously seen in France. He was at once printer, publisher, commentator, and author. Though prosperous, he showed that truth—or that which he saw as truth—was to him of more value than worldly gain. Having become a convert to the doctrines of the Reformation, he endeavored for some time to reconcile his convictions with the demeanor required by his position. But his Greek Testament of 1550 (in folio) drew upon him a public prosecution; and though the prosecutions failed legally, they were financially disastrous. Having first sent his family to Geneva, he followed them 1551. Later the S. family found that they had fled from Rom. Cath. persecution to Prot. controversy and censure. Robert, his second son, shortly afterward returned to Paris, where he resumed his father's business, returning to the Rom. Cath. Church.

HENRI ESTIENNE, sometimes called Henry the Second (1528–98; b. Paris; eldest son of Robert), succeeding his father on his death 1559, was repeatedly called before the consistory in Geneva, reprimanded, ordered to print cancels, and excommunicated. Though Henri had the same literary industry and ability as his father, he unfortunately lacked his father's practical turn of mind. Devoted to his art and to his calling, he seems to have been without worldly prudence. In two years he had revised and published more than 4,000 pages of Greek text; at the same time writing his *Apologia pro Herodoto,* a work of formidable length and learning. Ren-

dered nervous and irritable by an overworked brain, and by pecuniary difficulties gathering fast around him, the petty surveillance and censorship of the pious pastors of Geneva became intolerable. Travelling, originally undertaken from literary curiosity, grew into a necessity of life. In 1578, he visited Paris, where for several years he became a hanger-on of the court of Henry III., who bestowed on him a pension, which the state of the royal exchequer rendered merely nominal. Quitting Paris, he wandered in poverty over Europe, his own family often ignorant of where he was. He died at Lyon. Great as a publisher and commentator, Henri S. was not less great as a scholar; and his reputation as scholar and editor has increased in late years. His *Thesaurus Linguæ Græcæ* is his principal monument, and that 'could have been produced by no one but a giant.' His mastery of Greek seems to have been almost complete, and as a critic of the French language he is still esteemed in France.—See Feugère, *Caractères et Portraits* (1864); *Quarterly Review* (1865); article in the *Biographie Générale;* Bernard, *Les Estiennes* (1856); Renouard, *L'Imprimerie des Etiennes.*

STEPHENS, WILLIAM: 1671, Jan. 28—1753, Aug.; b. in the Isle of Wight. He was educated at King's College, Cambridge; studied law, but soon entered political life, and became a member of parliament. About 1730 he visited S. C., and through the influence of Gen. Oglethorpe became sec. of the Ga. colony 1737. He was pres. of the colony 1743–50, resigning on account of failure of his bodily and mental powers. He died in Georgia. He published a *Journal of the Proceedings in Georgia* (3 vols. 1742).

STEPHENSON, *stē'vĕn-son*, GEORGE: great improver of the locomotive: 1781, June 9—1848, Aug. 12; b. Wylam, eight m. from Newcastle, England. His family were in great poverty, his father having to maintain a family of six children on 12*s.* per week, earned by tending a colliery-engine. George's first employment was herding cows at 2*d.* per day, from which he was promoted to hoeing turnips at 4*d.*; subsequently, he was appointed fireman at Midmill Colliery, and at the age of 15 we find him rejoicing on his salary being raised to 12*s.* a week. As fireman, he applied himself to diligent study of the steam-engine, taking his machine to pieces during his leisure hours, and thus gaining a thorough practical knowledge of it. At Black Callerton Colliery, 1801, by dint of mending shoes and cleaning watches, in addition to his regular employment, S. contrived to save his first guinea. At 21 he had saved as much as enabled him to furnish a cottage in a humble way, and 1802, Nov. 28, he married Fanny Henderson: she died 1804, while her husband was brakesman at Killingworth Colliery. Out of his humble gains he paid 4*d.* a week for lessons in reading, writing, and arithmetic, which were conned over at night, and mastered by the light of his

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engine-fire. In 1815, his invention of a colliery safety-lamp, the 'Geordie,' brought his name before the public—a long controversy resulting from the fact of his invention being almost simultaneous with that of Sir H. Davy. In 1819, he married his second wife, Elizabeth Hindmarsh, daughter of a farmer at Black Callerton.

At Killingworth Colliery S. constructed his first locomotive, whose lack of efficiency he soon remedied with various improvements, notably the 'steam-blast.' In 1821, S. was appointed engineer for construction of the Stockton and Darlington railway; the line, on its completion, being partially worked by means of his great invention. About the same time he was chosen engineer of a projected railway between Liverpool and Manchester. That he proposed to work the line with an engine moving at the rate of 12 m. an hour was considered sufficient to stamp the project as a bubble. 'Twelve miles an hour!' exclaimed the *Quarterly Review*—'as well trust one's self to be fired off on a Congreve rocket.'

When the bill ultimately passed, 1826, S. was appointed principal engineer, with salary £1,000 a year. After immense difficulties, the line was completed 1829. Then ensued the memorable competition of engines, resulting in the triumph of S.'s 'Rocket' (see the quotation above), which, to the astonishment of every one except himself, was found capable of travelling at the then amazing rate of 35 m. an hour. While occupied in carrying out the vast system of railway which soon overspread the country, S.'s home was at Alton Grange, near Leicester. He saw little of it, however, as he was often travelling on business for weeks at a time. During the three years ending 1837, he was principal engineer on the N. Midland, York and N. Midland, Manchester and Leeds, Birmingham and Derby, and Sheffield and Rotherham railways. He has been known to dictate reports and letters continuously for 12 hours. But his heart remained youthful: in spring, he would snatch a day for bird-nesting or gardening: in autumn, nutting was still a favorite recreation. During the railway mania, his offices in London were crowded every day with men of every rank and condition, eager to strengthen their prospectuses by the weight of his name. Where he disapproved—and at this time he almost always did disapprove—he invariably declined, though by acceding he might have made enormous gain. In the autumn of 1845, he visited Belgium and Spain for professional purposes, and on his way home was seized with pleurisy, from which he seems never to have thoroughly recovered. He occupied his declining years with the quiet pursuits of a country gentleman; and died at his country-seat of Tapton. The leading features of his mind were honesty and indomitable purpose: 'I have fought for the locomotive single-handed for nearly twenty years,' he says; 'I put up with every

rebuff, determined not to be put down.' Toward trickery and affectation he never concealed his contempt, while honest merit never appealed to his liberality in vain.—See *Lives of Engineers,* by Samuel Smiles, III. (London, 1862).

STEPHENSON, ROBERT, D.C.L.: engineer: 1803, Oct. 16—1859, Oct. 12; only son of George Stephenson. He attended a school in Newcastle. In 1820, his father was able to send him to the University of Edinburgh. In 1823, he assisted his father in the survey of the Stockton and Darlington railway, and subsequently in the locomotive engine-works at Newcastle—taking the management about 1827. During the discussion as to the power on the projected Liverpool and Manchester line (see STEPHENSON, GEORGE), he was in constant communication with his father, to whom his quick perception and judgment were of great assistance. Soon afterward he was appointed engineer of the Leicester and Swanington railway; and then joint managing engineer with his father of the London and Birmingham line. In 1829, he married Frances, daughter of John Sanderson, merchant in London; she died 1842 without issue; and he did not marry again. His work on the London and Birmingham line raised Stephenson to the very highest rank in his profession: business flowed in on him; in one parliamentary session he was engaged in 33 new schemes. Projectors thought themselves fortunate if they could procure his services on any terms.

The Britannia Tubular Bridge, completed 1850, of which Stephenson was the master spirit, is one of the great engineering achievements of the century. See BRIDGE; TUBULAR BRIDGE.

Of the same class were his Victoria tubular bridge across the St. Lawrence at Montreal, and the two bridges across the Nile at Damietta. In 1847 he was returned to the house of commons for Whitby. In 1850 he completed the great viaduct across the Tweed at Berwick. In 1855 the emperor of the French decorated him with the Legion of Honor, the University of Oxford made him D.C.L., and he was elected president of the Institute of Civil Engineers.—In Norway, 1859, he was seized by the illness which ended his illustrious career. He was buried in Westminster Abbey.—It was as a workman that Stephenson was great, his political views being at times rather narrow. Contrasting him with his great rival Brunel, it has been said that Brunel's ambition was to make a great work, Stephenson's to make a work which would *pay.* Robert Stephenson inherited the kindly spirit and benevolent disposition of his father; and to him he was ever ready to attribute the chief merit of his own achievements.—See *Lives of the Engineers,* by S. Smiles, III. (London, 1862).

STEPNIAK, *stĕp'nĭ-ăk: nom de guerre* of SERGIUS MICHAEL DRAGOMANOFF: Russian nihilist leader and

writer: b. 1841 at Hadjatsh, in the Ukraine Mountains; d. 1895, Dec. 23. He was educated at Kieff University, meanwhile publishing several works which were suppressed by government. He was tutor in history at Kieff 1865, and professor 1870, but was dismissed from his post 1873; three years later he was exiled on account of his criticisms of the system pursued by Count Tolstoi in administering the department of public instruction. Stepniak settled at Geneva, and continued the revolutionary propaganda, publishing numerous popular tractates in the dialect of Little Russia. Later he took up his residence in London, where he contrived to maintain a secret regular correspondence with the disaffected elements in his native land. He labored through frequent contributions to magazines, newspapers, etc., in Europe and America, and by public discourses, to diffuse information concerning the social and political conditions of the Russian people. Among his principal published works are: *The Turks Within and Without; Tyrannicide in Russia; Little Russian Internationalism; Historical Poland and the Muscovite Democracy.* He wrote much also on the ethnography, history, and literature of Little Russia.

STEPPE, n. *stĕp,* plu. STEPPES, *stĕps* [Ger. *steppe,* a heath, a desert: Russ. *stepe,* a steppe]: one of the vast flats or plains of Russia, corresponding to the prairies, savannahs, and pampas of America. The steppes, vast, treeless and semi-barren, with occasional low ranges of hills, stretch from the Dnieper across s.e. European Russia, round the shores of the Caspian and Aral seas, between the Altai and Ural chains, and occupy the low lands of Siberia. In spring and early summer the steppes have a thin covering of herbage, become parched and barren under the scorching heat and drought of June, and in winter are hid beneath deep snow, which, raised in huge white thin clouds, and driven hither and thither by furious storms, brings destruction to every living creature within its sweep. The monotony of the steppe is as fatiguing to the traveler as that of the sandy, arid desert; for hundreds of leagues there stretches to the horizon the same unvarying level of scanty herbage, unbroken by tree or bush; only in spring, while the vegetation is succulent and fitted for pasture, is the solitude broken here and there by herds of horses and cattle, and their mounted guardians. In autumn, when the tall herbage, withered by summer heats, has been rooted up and broken by violent winds, it becomes gathered and rolled together into enormous balls, sometimes 30 ft. in diameter. A few tracts offer some inducement to the agriculturist; such are the steppe e. of the Dnieper, that between the Don and Volga—rich in coal—and the steppes of s.w. Siberia, especially those in the government of Tomsk, all of which have been partially colonized; but the great extent is hopelessly barren.

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